U.S. Climate Resilience Toolkit & Climate Explorer Demo

toolkit.climate.gov

David Herring, program manager
NOAA OAR/Climate Program Office
301-734-1207 | david.herring@noaa.gov

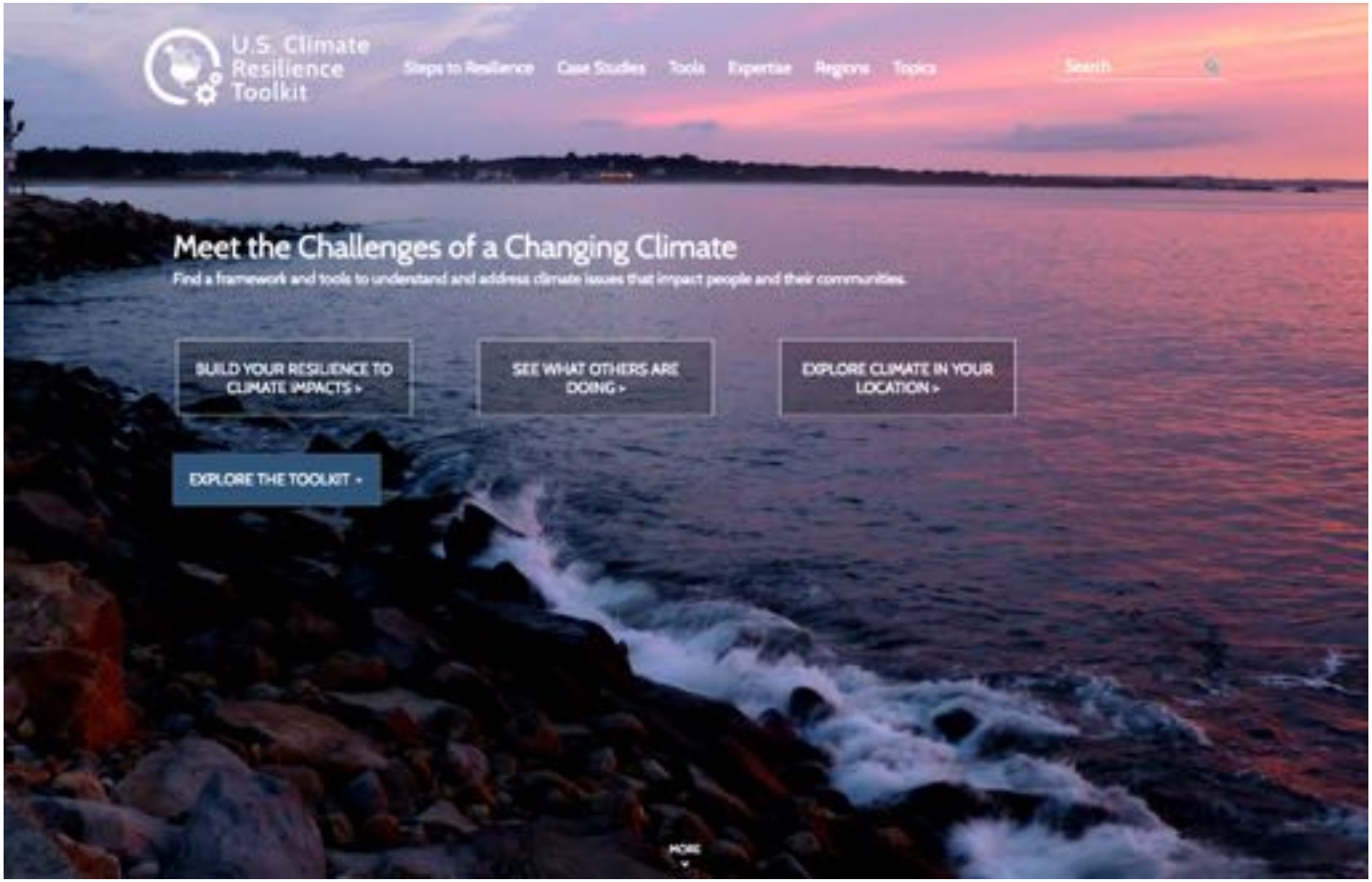
Overview for the National Weather Service

December 20, 2016

Toolkit presentation overview

- Primary target audience & their motivations
  - User engagement is central to our strategy
- New design features & functionality
  - Climate Explorer v2
  - Climate by Location with downscaled climate projections
  - New & expanded content sections
  - Steps to Resilience enhancements
- Defining & measuring success
- Future plans

Online at https://toolkit.climate.gov



CRT goals, objectives & desired outcome

Desired Outcomes:
Municipalities, communities and businesses that are more resilient to climate-related impacts and extreme events (aided by **using** the Toolkit)

Goals:
1. Help people find and use science-based tools, information, and expertise to make and implement a climate resilience plan.
2. Help people understand and manage their climate-related risks and opportunities

Objectives:
- Steps to Resilience — online guide through an adaptation planning process
- Develop an integrating framework for aggregating and contextualizing science-based information, tools, and expertise from all across the federal government in one easy-to-use location.
- Open-source mapping & graphing tool to help people explore their assets' exposure to climate-related hazards; and downscaled climate projections
- Real-world case studies to illustrate examples of resilience-building in every sector and region of the nation.
- "No wrong door" approach to navigating our cross-walked resources

CRT's Primary & Secondary Target Audiences

Primary Target Audiences:

(a) "Go the last mile" climate adaptation / decision-support service providers

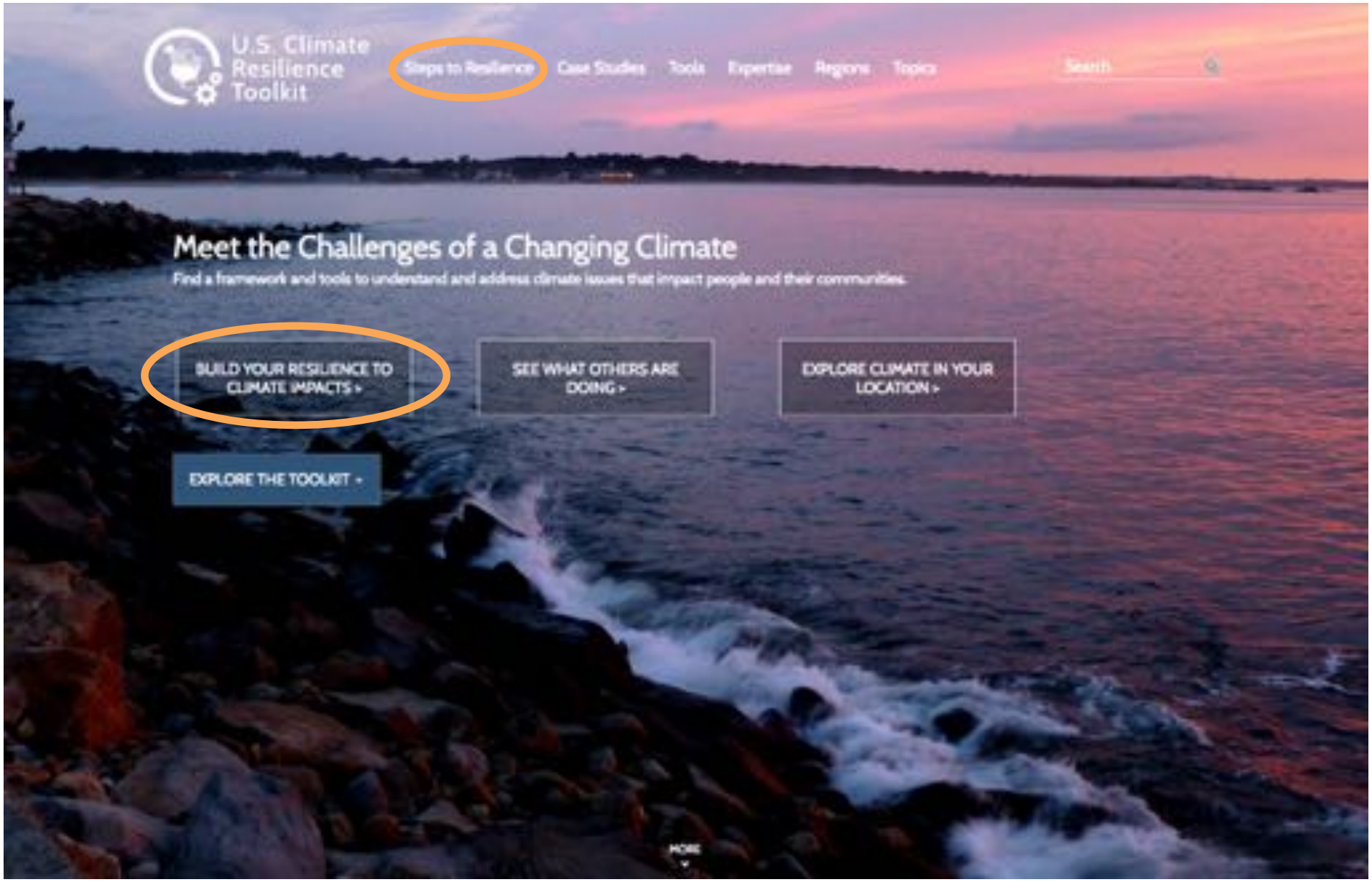
(b) Application-oriented professionals — planners, policy makers, resource/facility managers, business leaders — who want to make & implement a climate resilience plan.

Secondary Audiences

1. Executive Leaders — people who have the authority to make binding policy decisions and/or allocate resources (funding, FTEs).

2. Climate-interested Public — citizens who are interested in learning more about the causes and effects of climate variability and change, and what we can do about it.

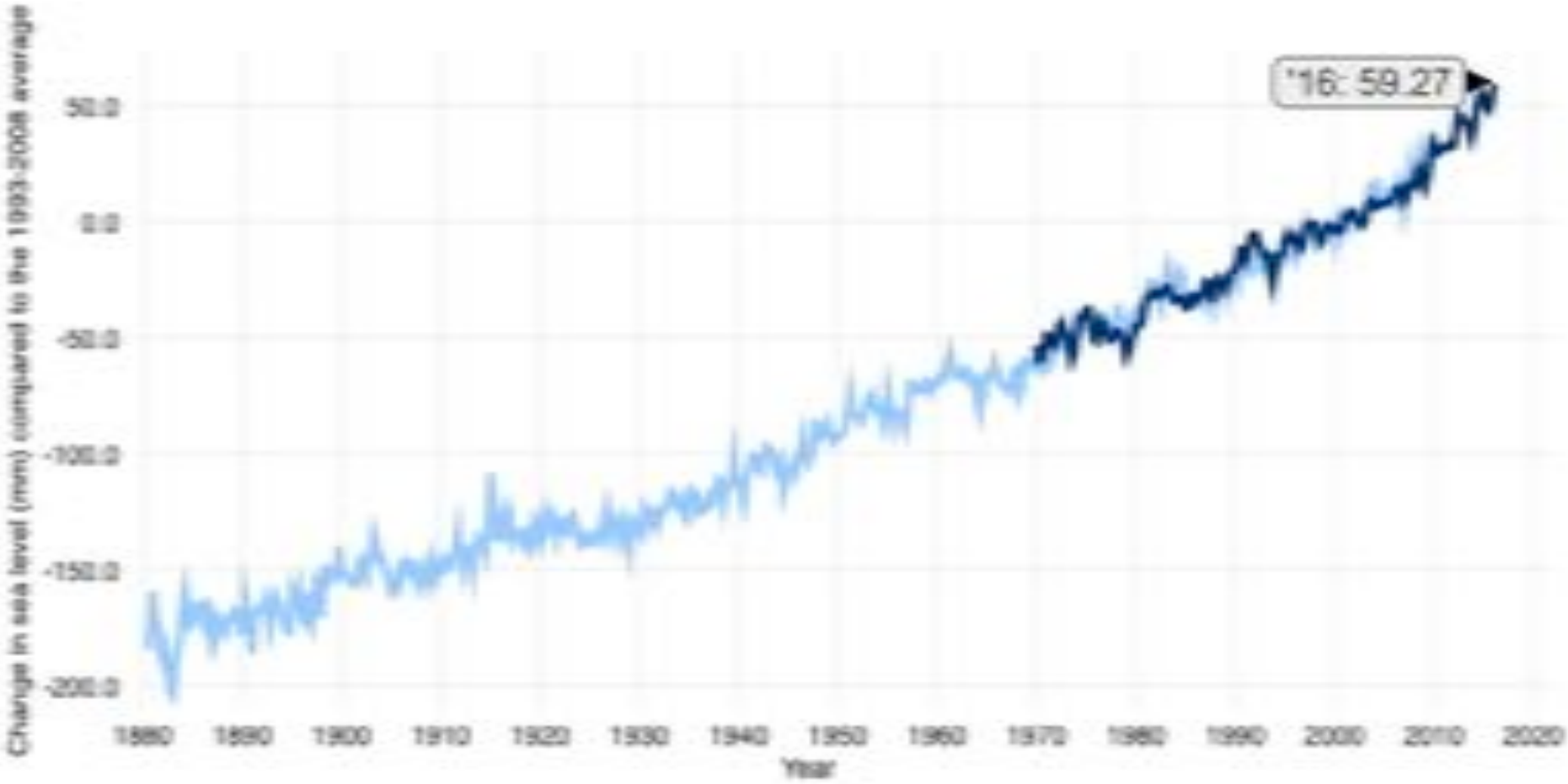
People seeking help with building resilience



Resilience is the capacity to withstand or recover from a disruption

(This concept is scalable from a single organism to entire systems — natural & human-built.)

Threats global sea level rise



Source: NOAA Climate.gov

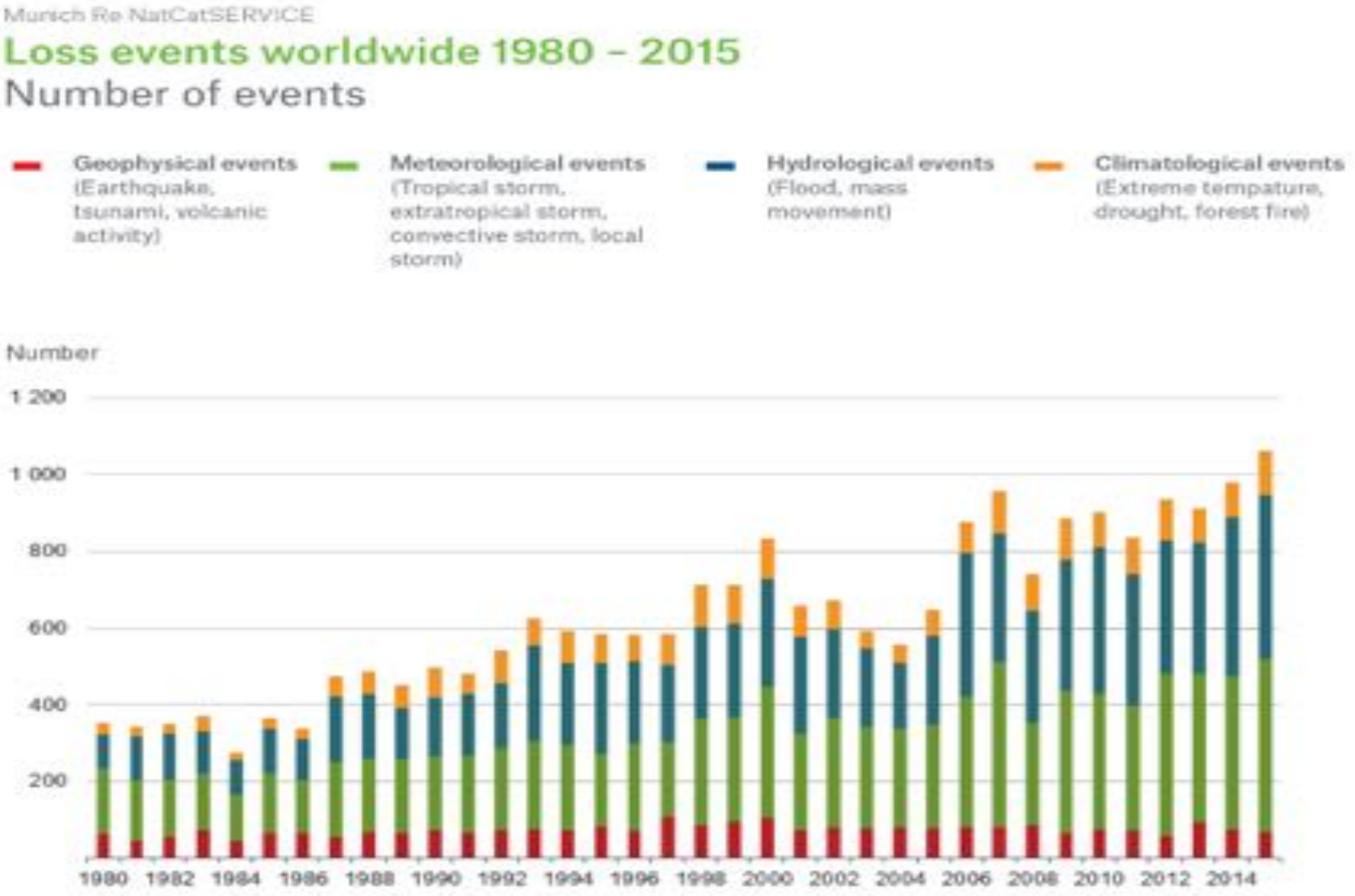
Threats hurricanes

Assets

Threats & Assets drought & water

Threats & Assets wildfire & property

Natural catastrophes worldwide are on the rise



Source: Munich Re

5 Steps to Resilience

Step 1: Explore climate threats

Step 2: Assess vulnerability & risk

Step 3: Investigate options

Step 4: Prioritize actions

Step 5: Take Action!

Did you know?

Why should we care?

What can we do about it?

Case Study: Flooding in St. Louis


Dec 29, 2015
St. Louis Post Dispatch

Case Study: Flooding in St. Louis

Identifying High-Priority Conservation Lands to Enhance Flood Mitigation

Community groups are working to establish a connected ring of conservation land around St. Louis, Missouri. They're using an innovative strategy to help them target land that can also enhance their flood mitigation efforts.

Stressors and impacts

The St. Louis metropolitan region sits at the confluence of two of North America's great rivers—the Mississippi and Missouri—and stretches across land where the Meramec and Cuivre rivers flow. Together, the region's rivers and streams channel rain and melted snow from a huge portion of the continent. Unsurprisingly, floodplains across the region experience relatively frequent flooding, sometimes accompanied by property damage and fatalities. As climate changes, increases in heavy precipitation and earlier spring snowmelt may increase the frequency of this flooding.

Benefits of rivers

Though the rivers are a potential source of flooding, they are also a source of jobs, and they provide recreation and connectivity across the region. In 2000, the Clean Water, Safe Parks, and Community Trails Initiative launched an effort to use rivers and floodplains to make the St. Louis region a clean, green, and connected

Steps to Resilience:

- Step 1: Explore Climate Threats
- Step 2: Assess Vulnerability & Risks
- Step 3: Investigate Options
- Step 4: Prioritize Actions
- Step 5: Taking Action

Tools:

Hazus-MH ›

Topic:

Ecosystems › Protecting and Enhancing the Resilience of Ecosystems ›

Water › Flooding ›

Additional Resources:

Ecological Economics: "Floodplain conservation as a flood mitigation strategy: Examining costs and benefits" ›

"Measuring Resilience to Climate Change: The Benefits of Forest Conservation in the Floodplain" (PDF article) ›

Partners:

Resources for the Future | Center for the

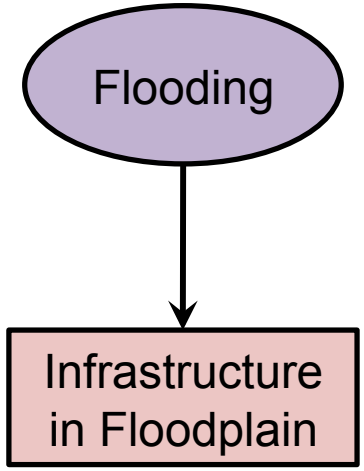
think in systems

Asset >

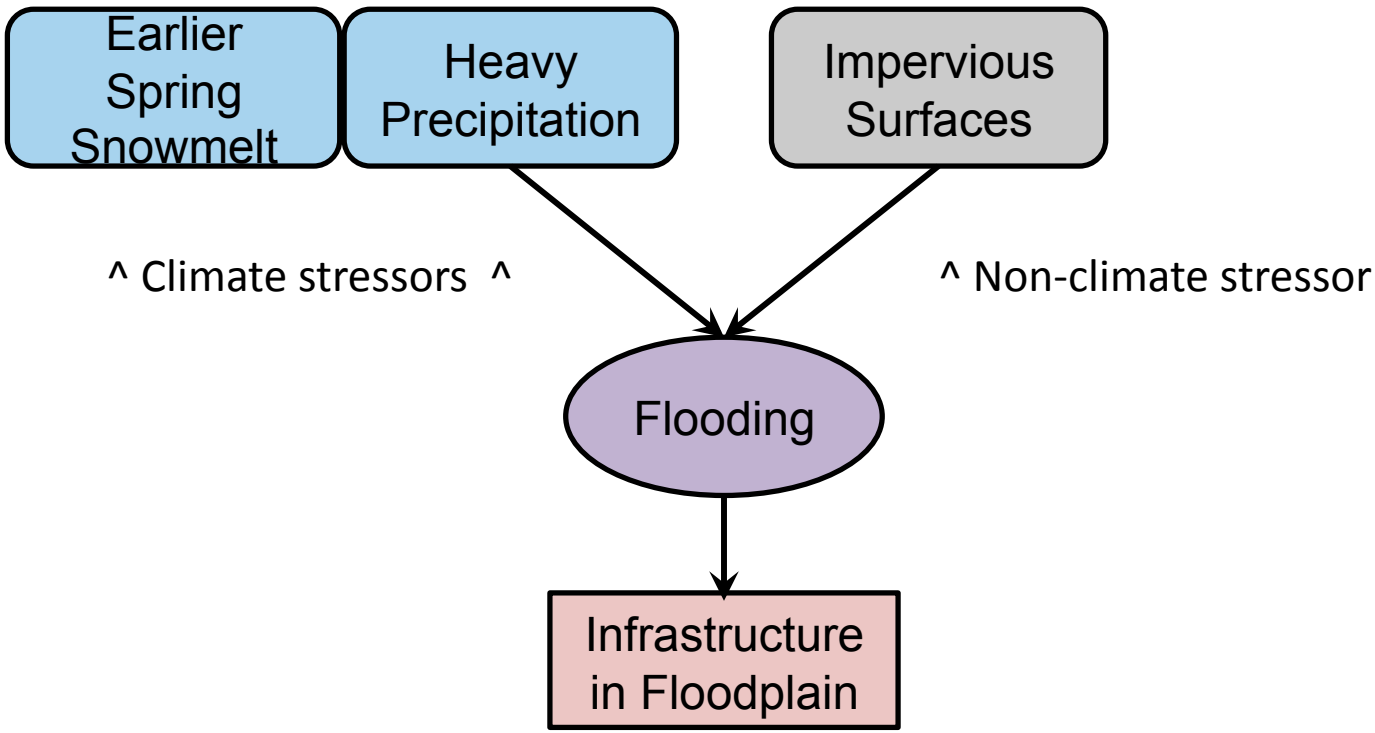
Infrastructure in Floodplain

think in systems

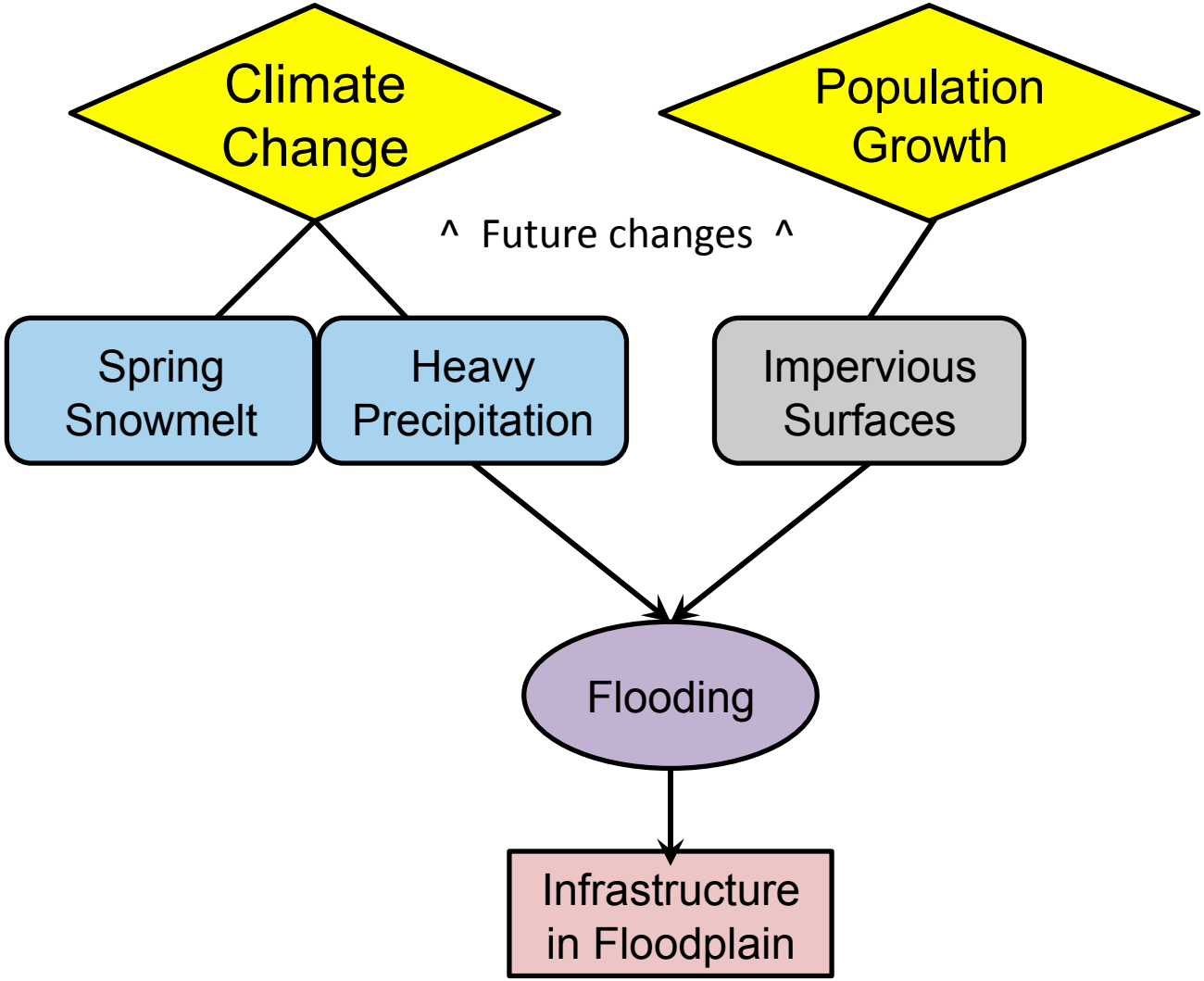
Threat >



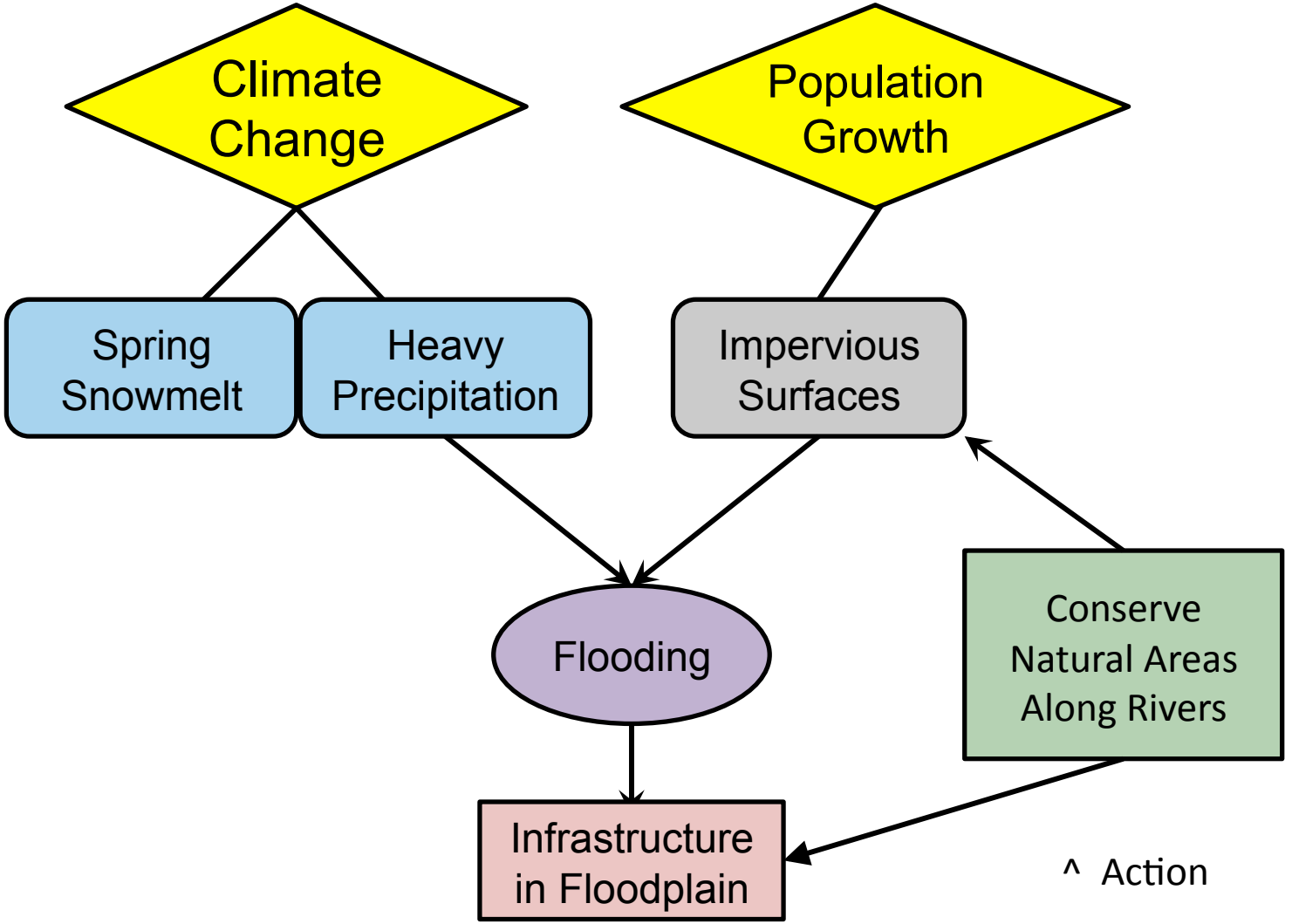
think in systems



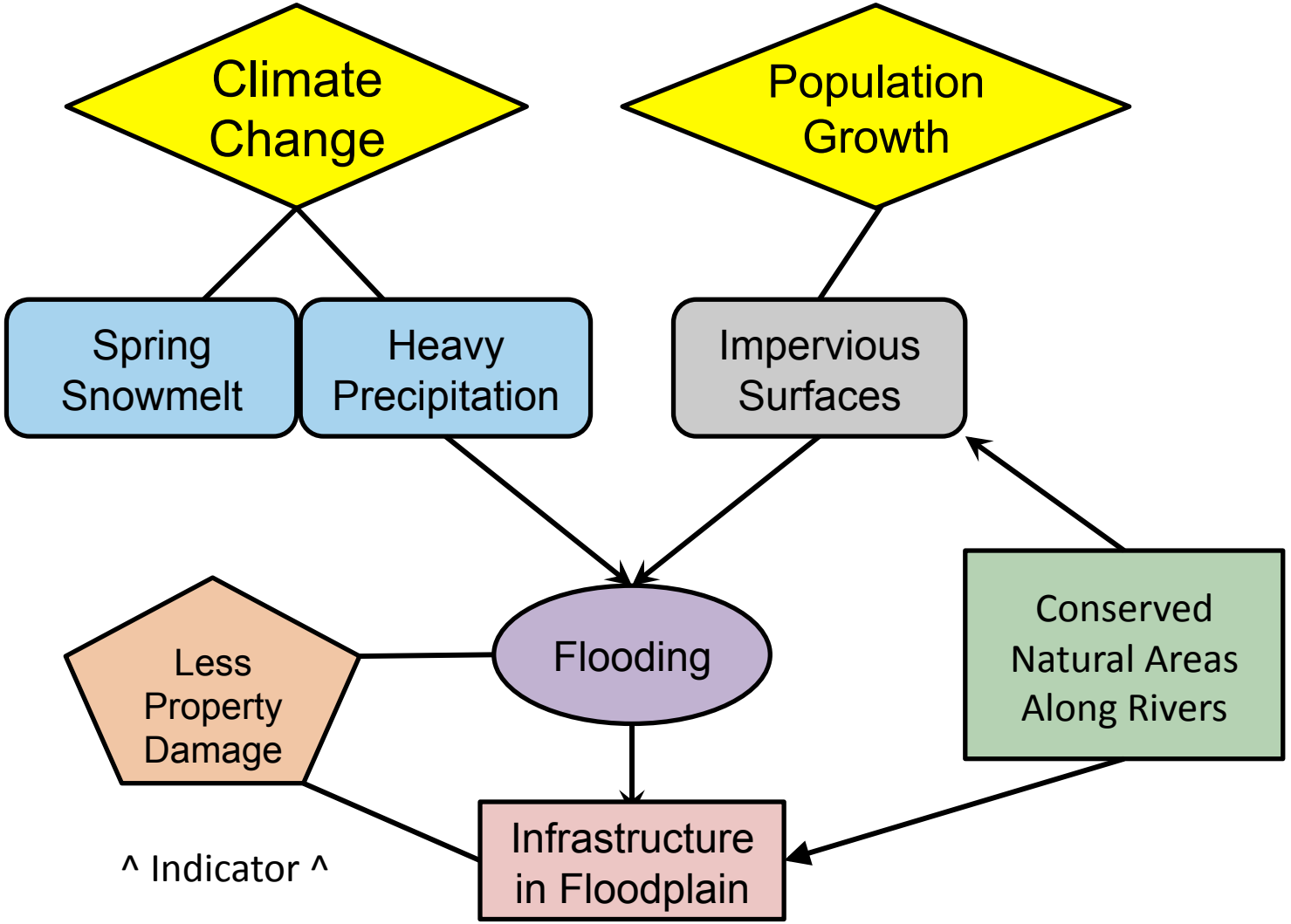
think in systems



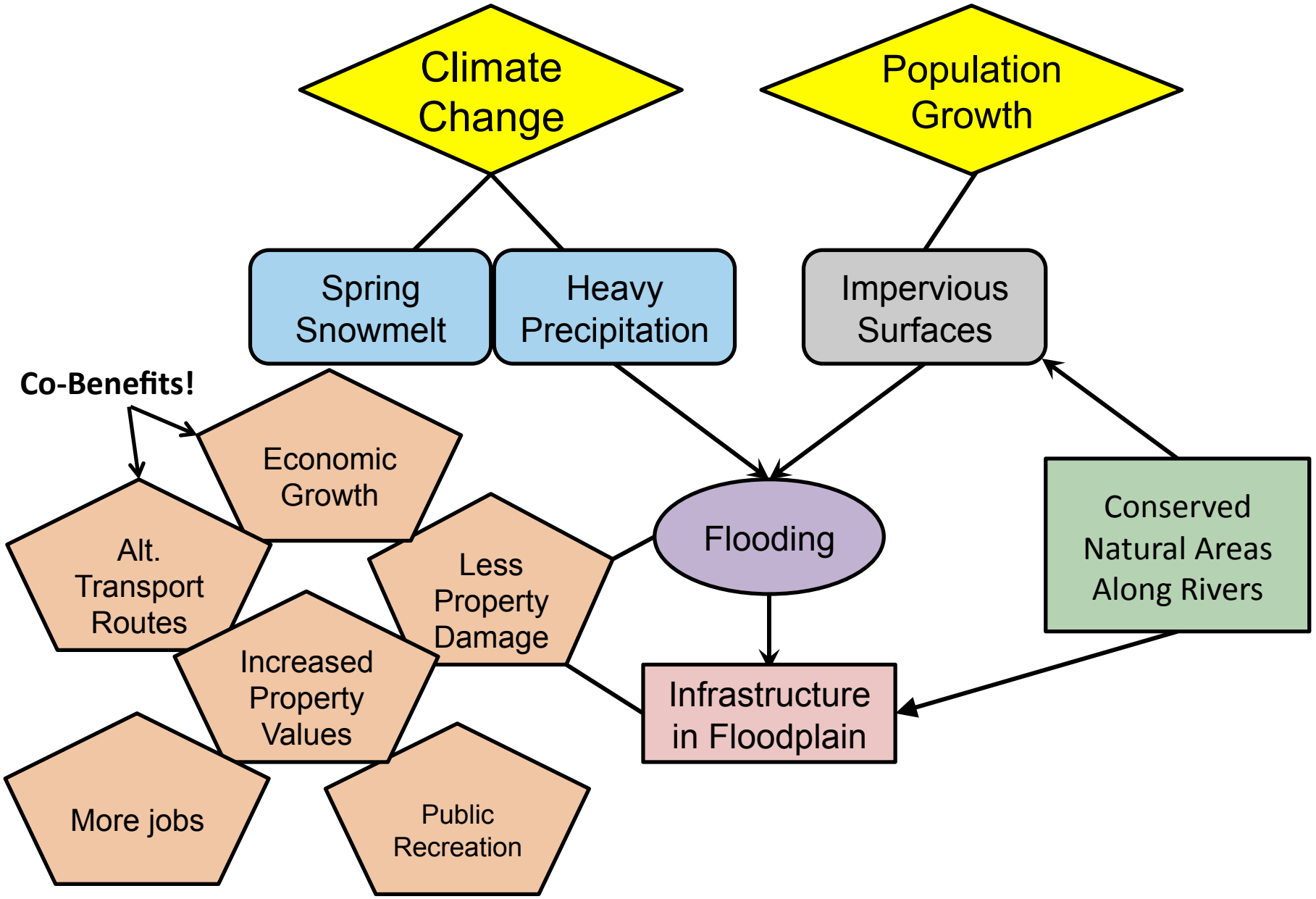
think in systems



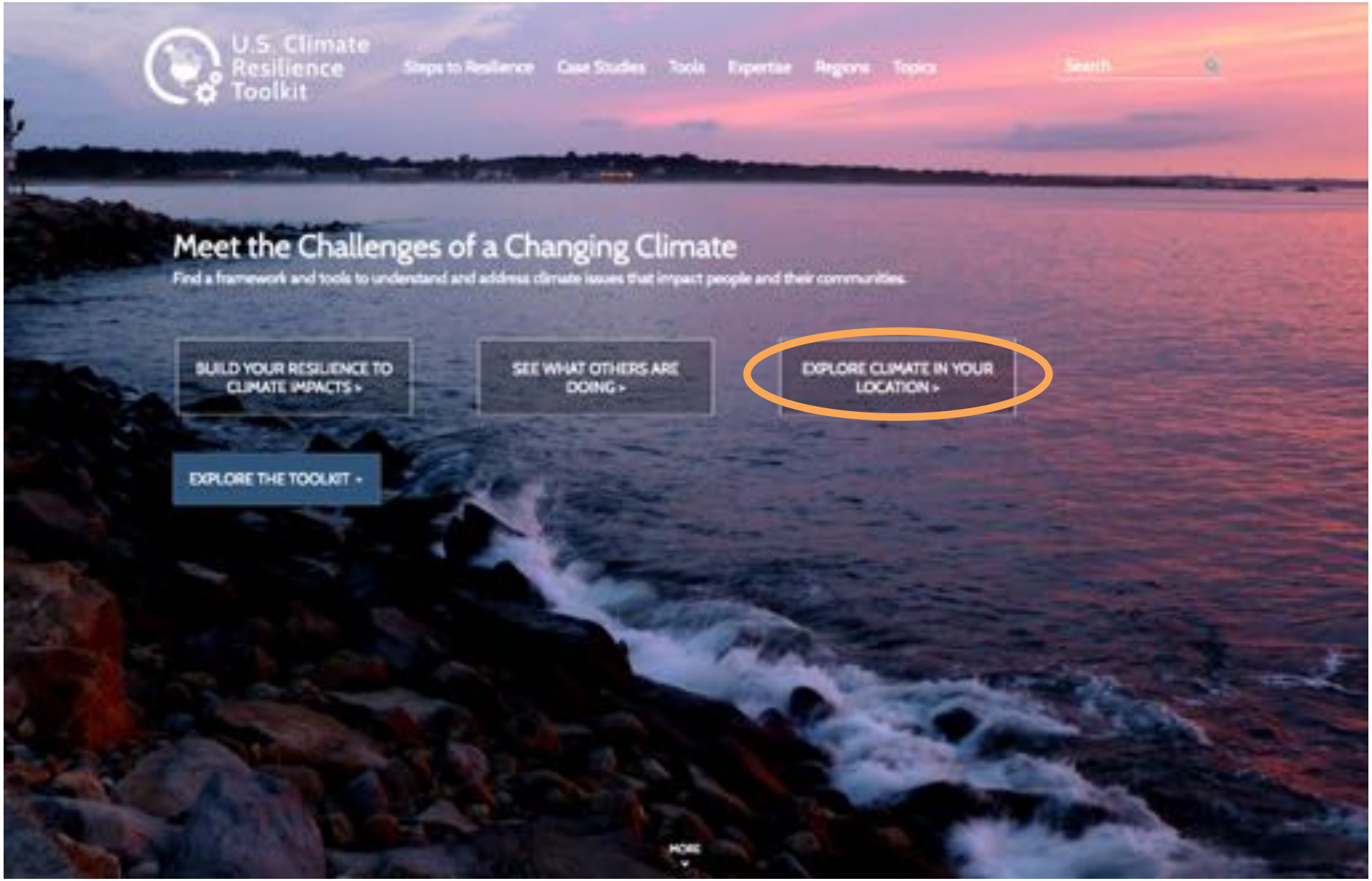
think in systems



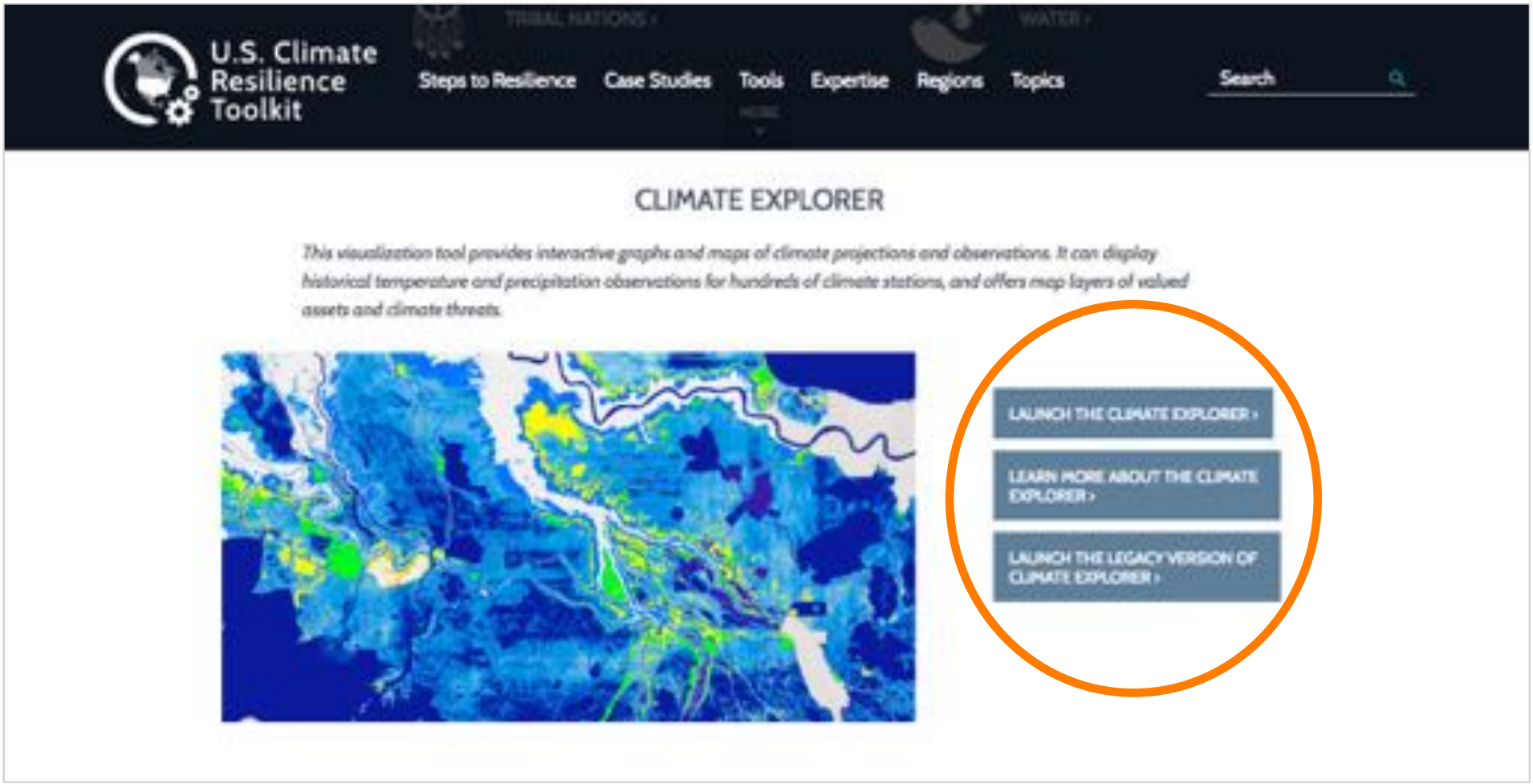
think in systems



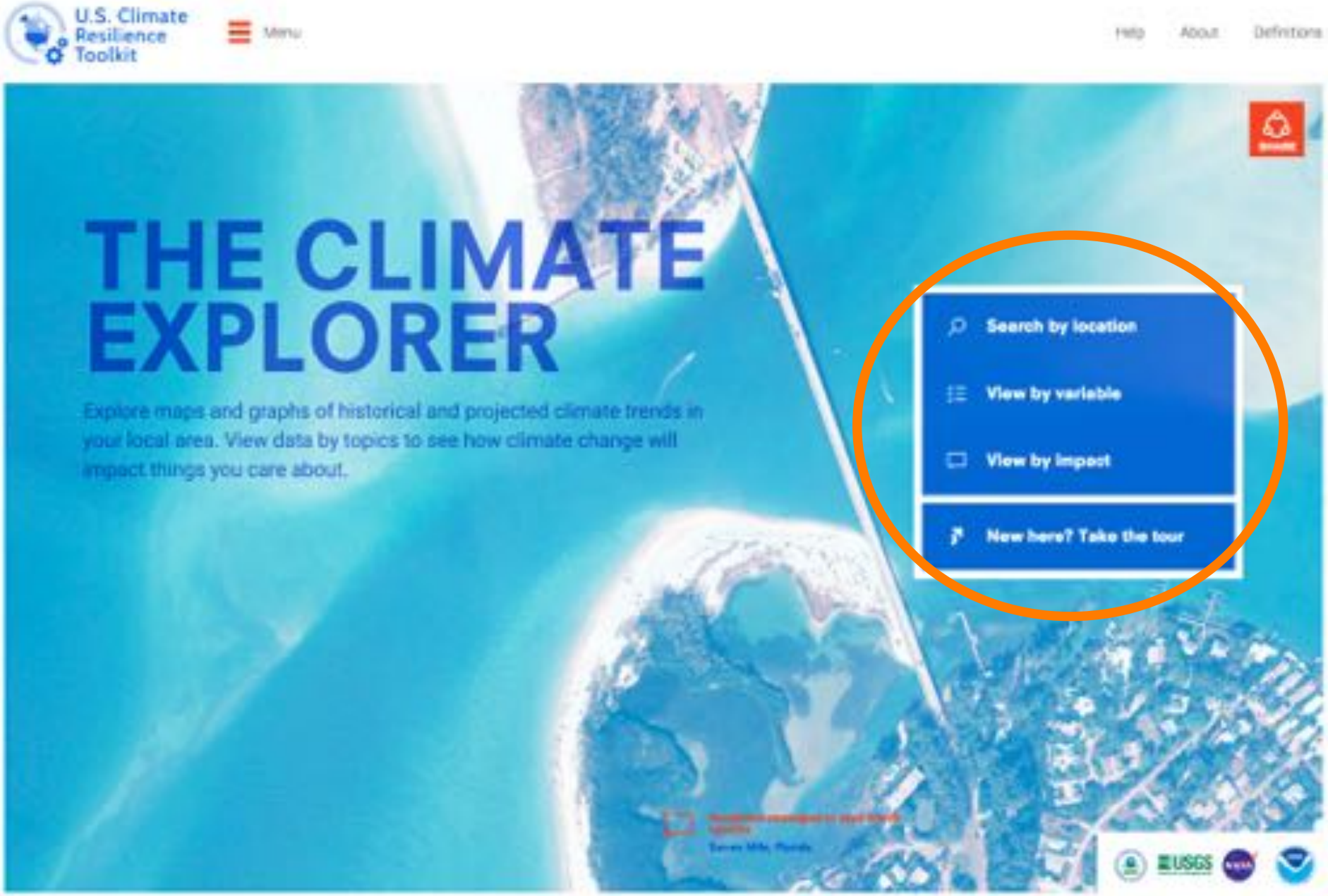
Users want climate data for their location



Two open-source versions of Climate Explorer



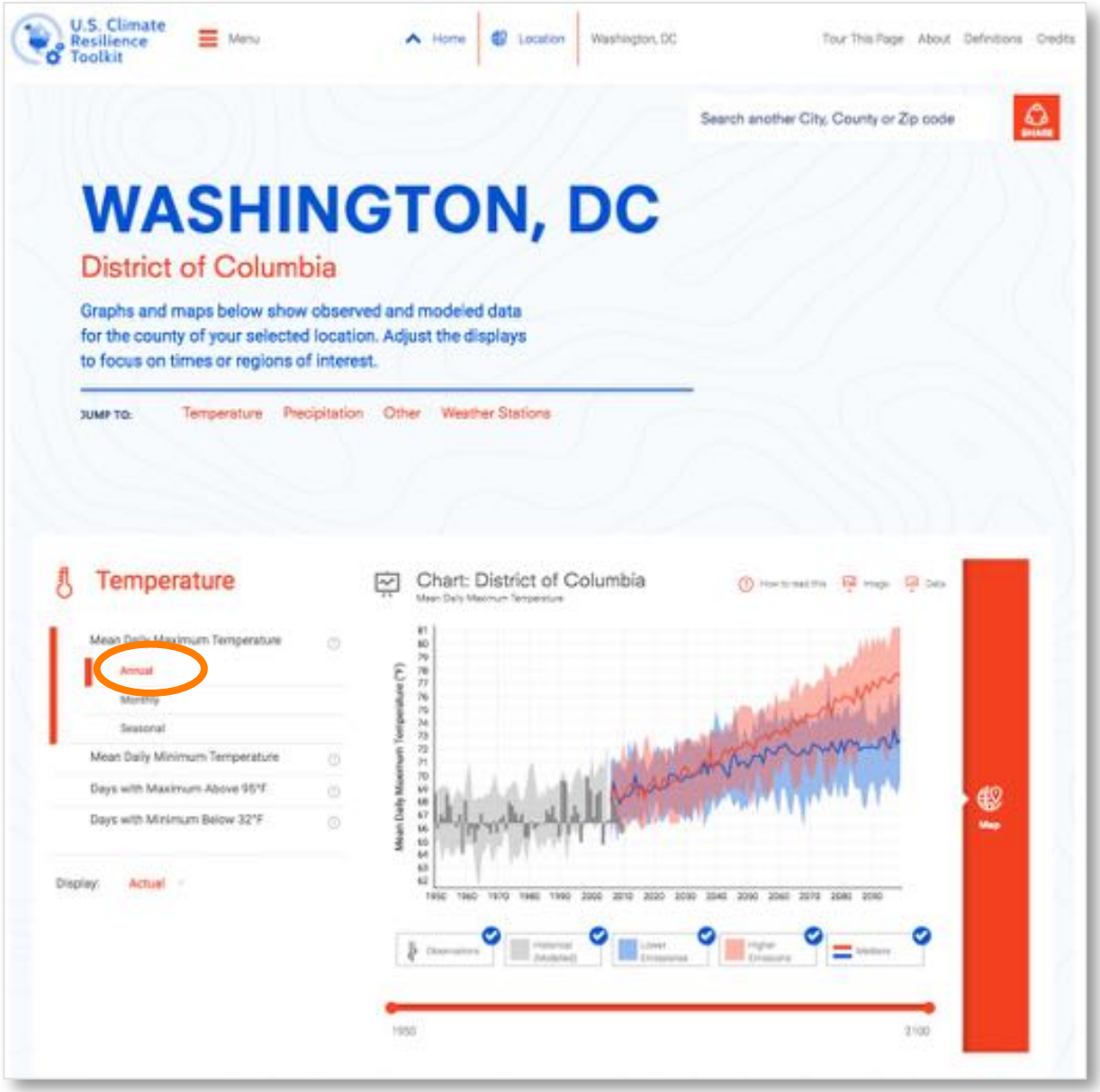
Online at https://toolkit.climate.gov/ce2



Search by Location

This graph shows historical model data (light gray band) compared to observed historical **annual values** (dark gray bars).

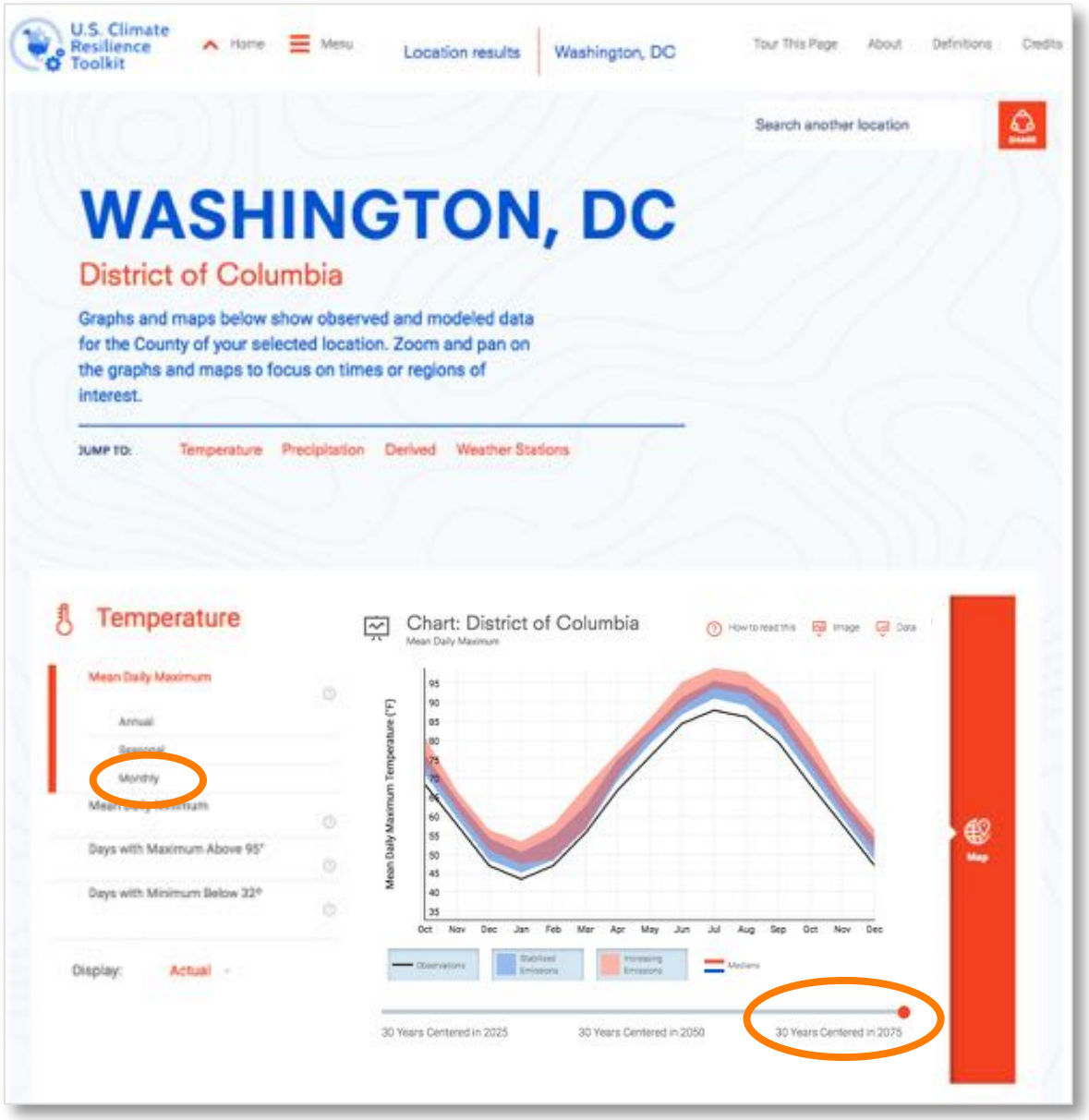
Also, projected future annual values from 2010 - 2100 for two possible scenarios — RCP 8.5 (red) & 4.5 (blue).



Search by Location

With modeled data compared to historical observed 30-year average.

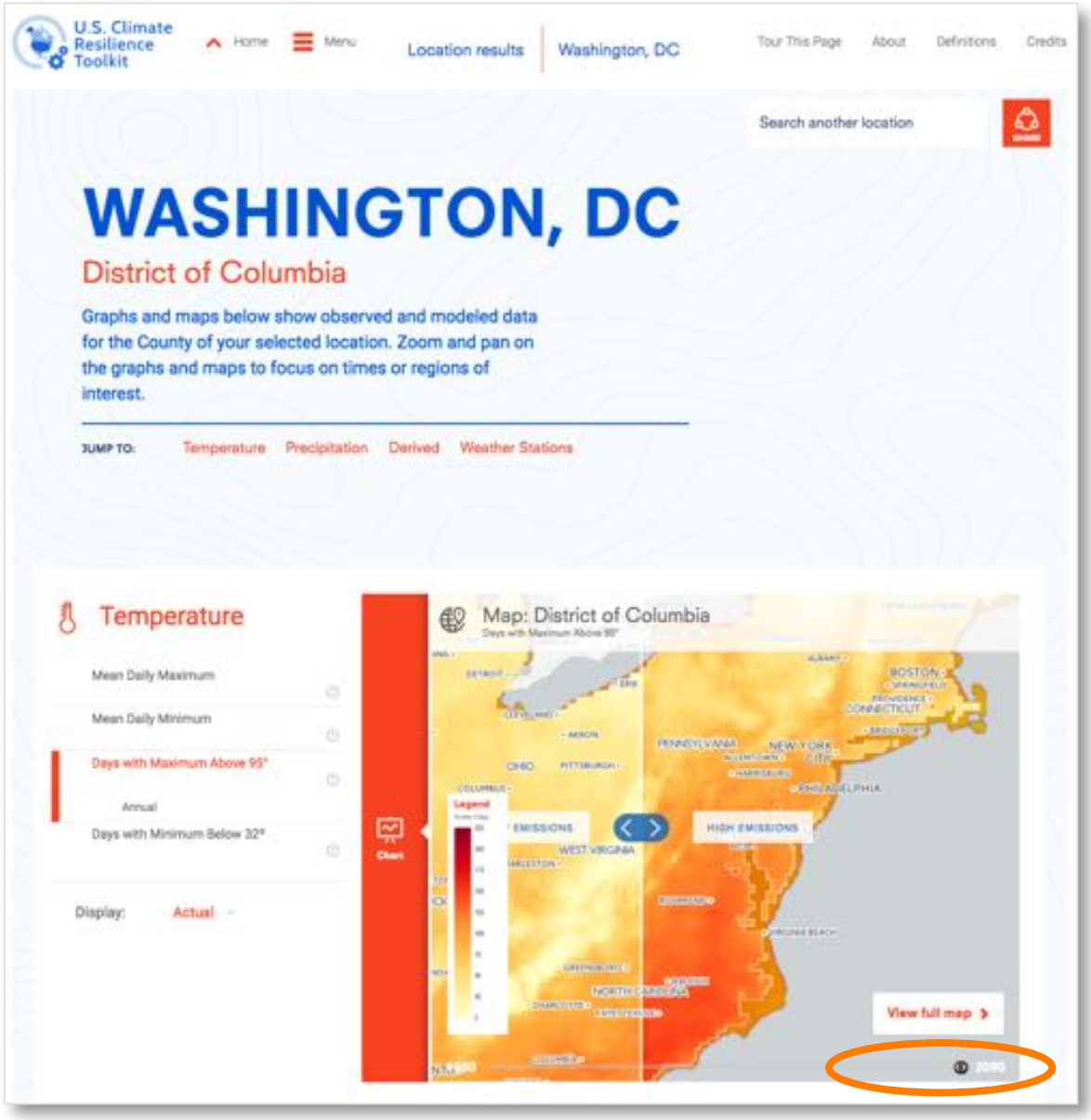
This graph shows projected **monthly values** for both RCP 8.5 (red) & 4.5 (blue) for three 30-year periods compared to the 1980-2010 average (black lines).



Search by Location

Users can toggle over to a **map view** of their location.

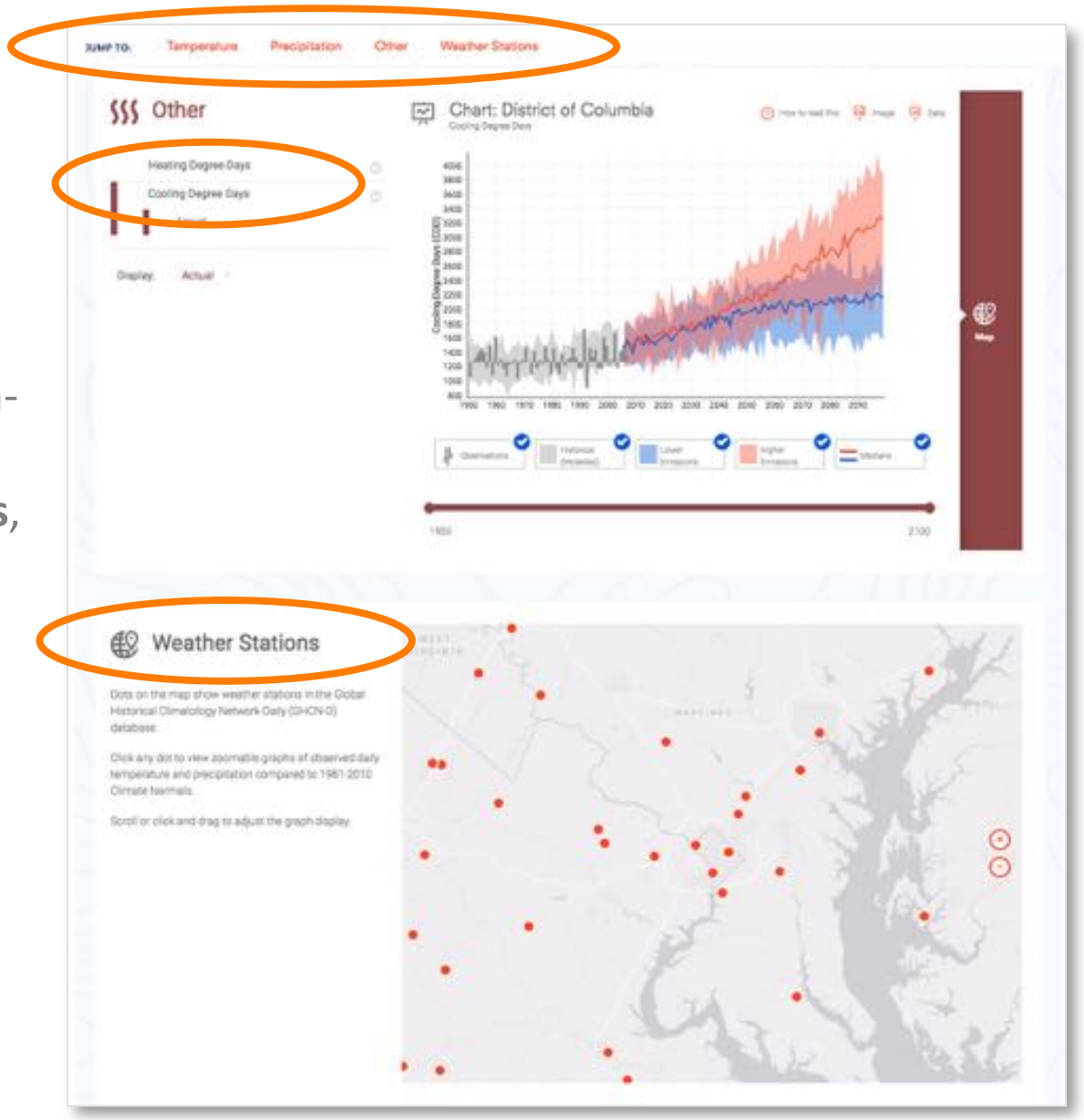
Users can select year of interest (in 10-yr increments) to visually compare the two RCP scenarios.



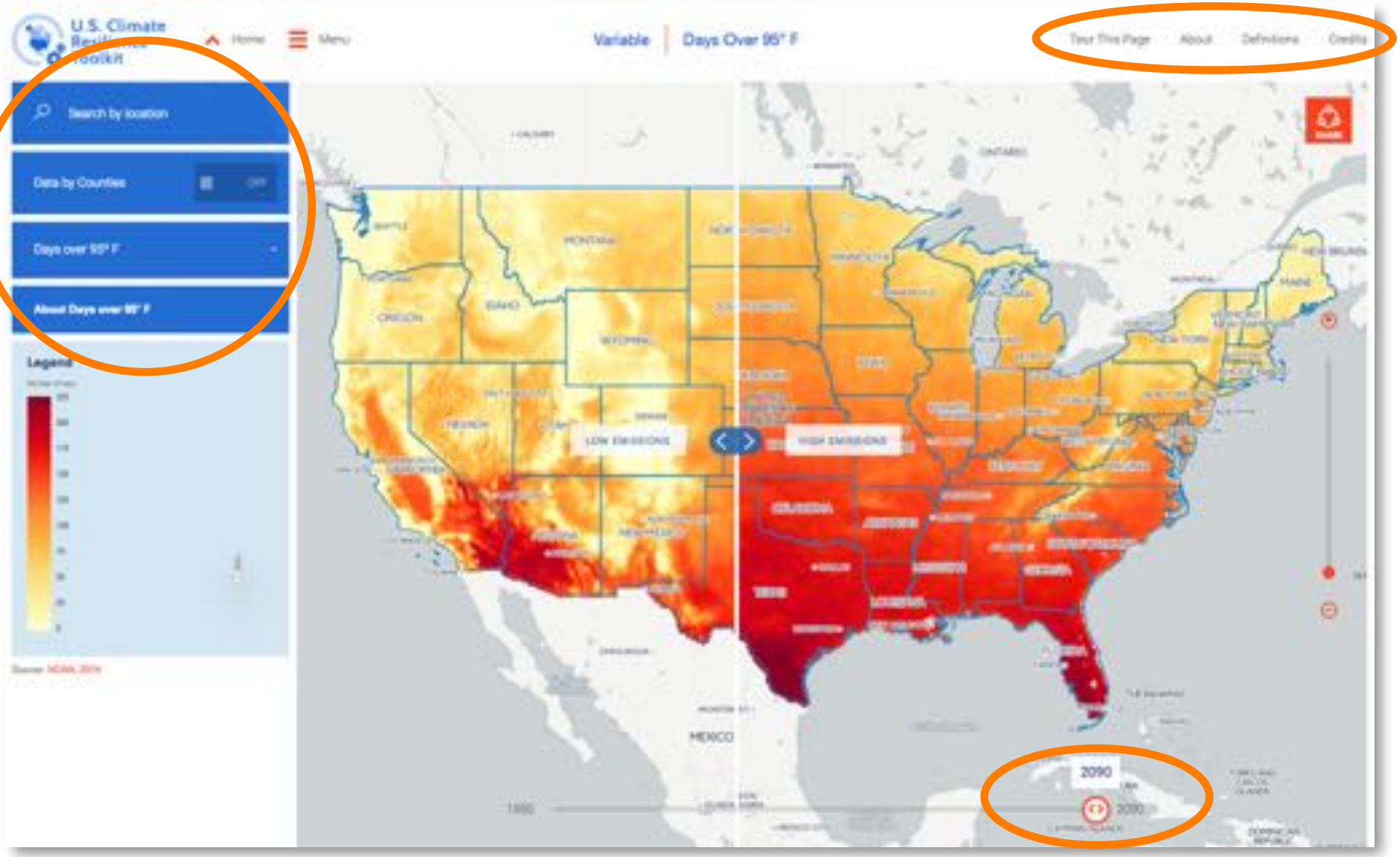
Search by Location

In addition to temperature, users can access precipitation-related data and other **decision-relevant parameters**, like “cooling degree days.”

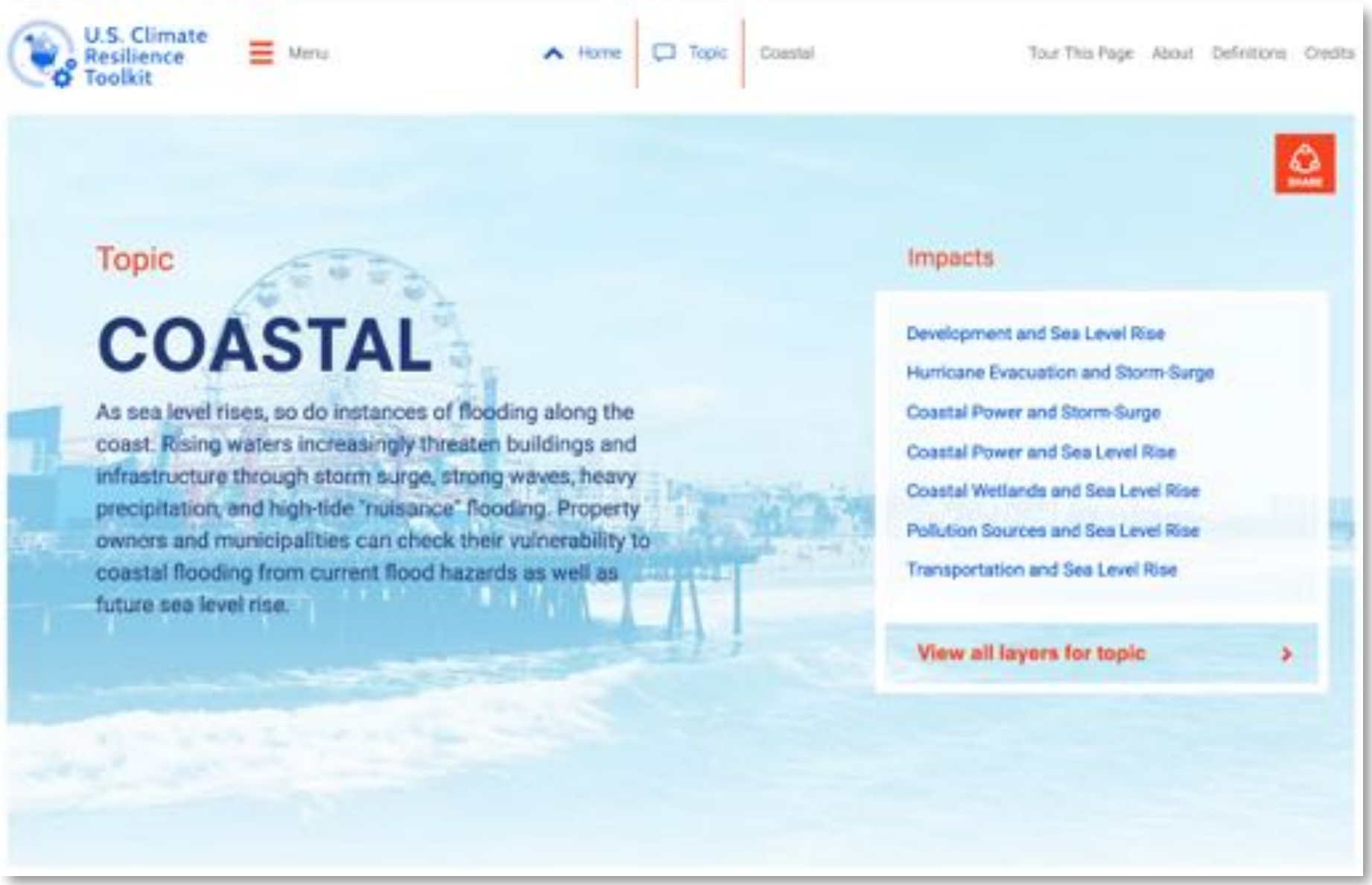
Users can also browse individual **observing stations** to access graphs of weather data on top of climatology data for each location.



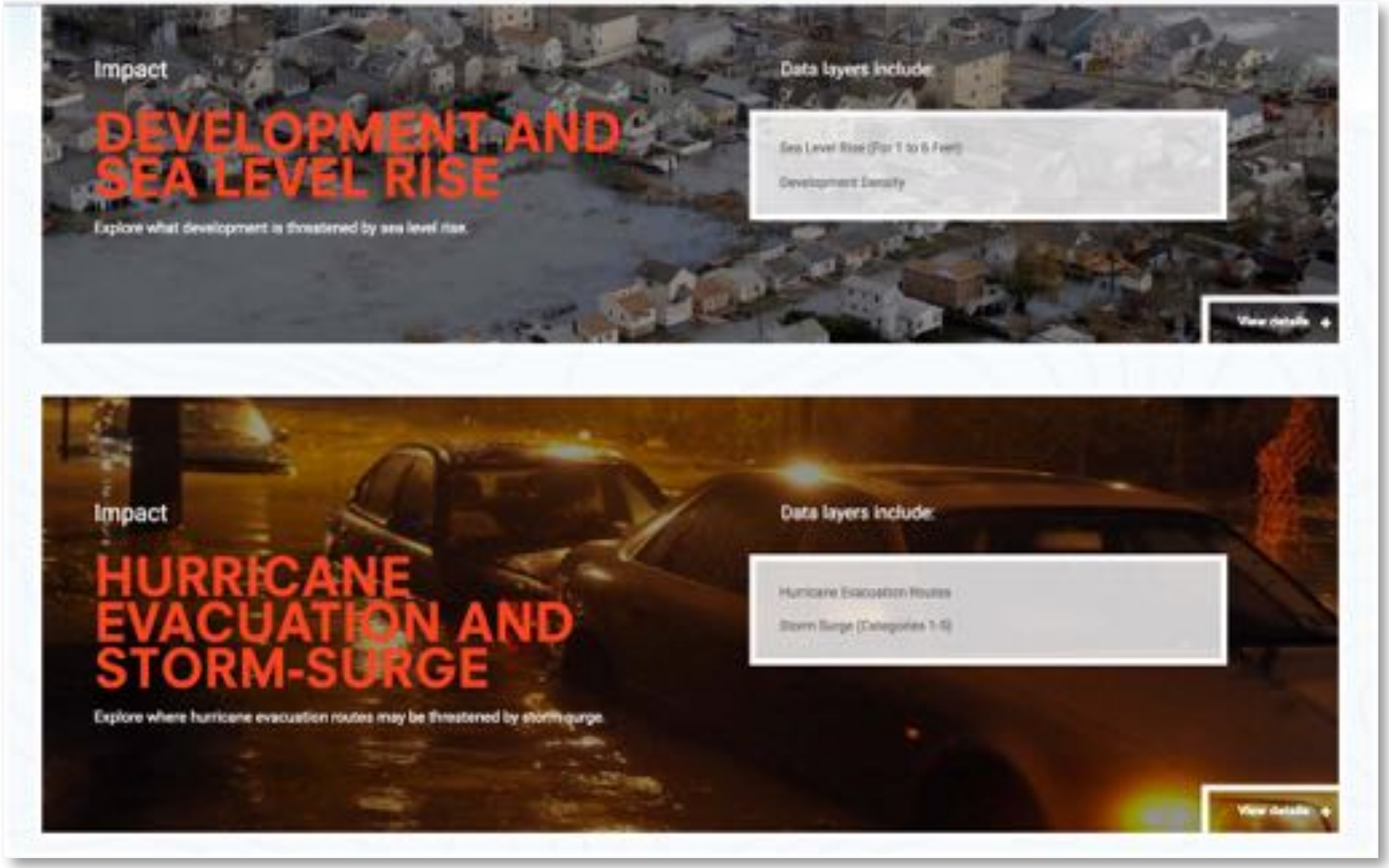
Search by Variable



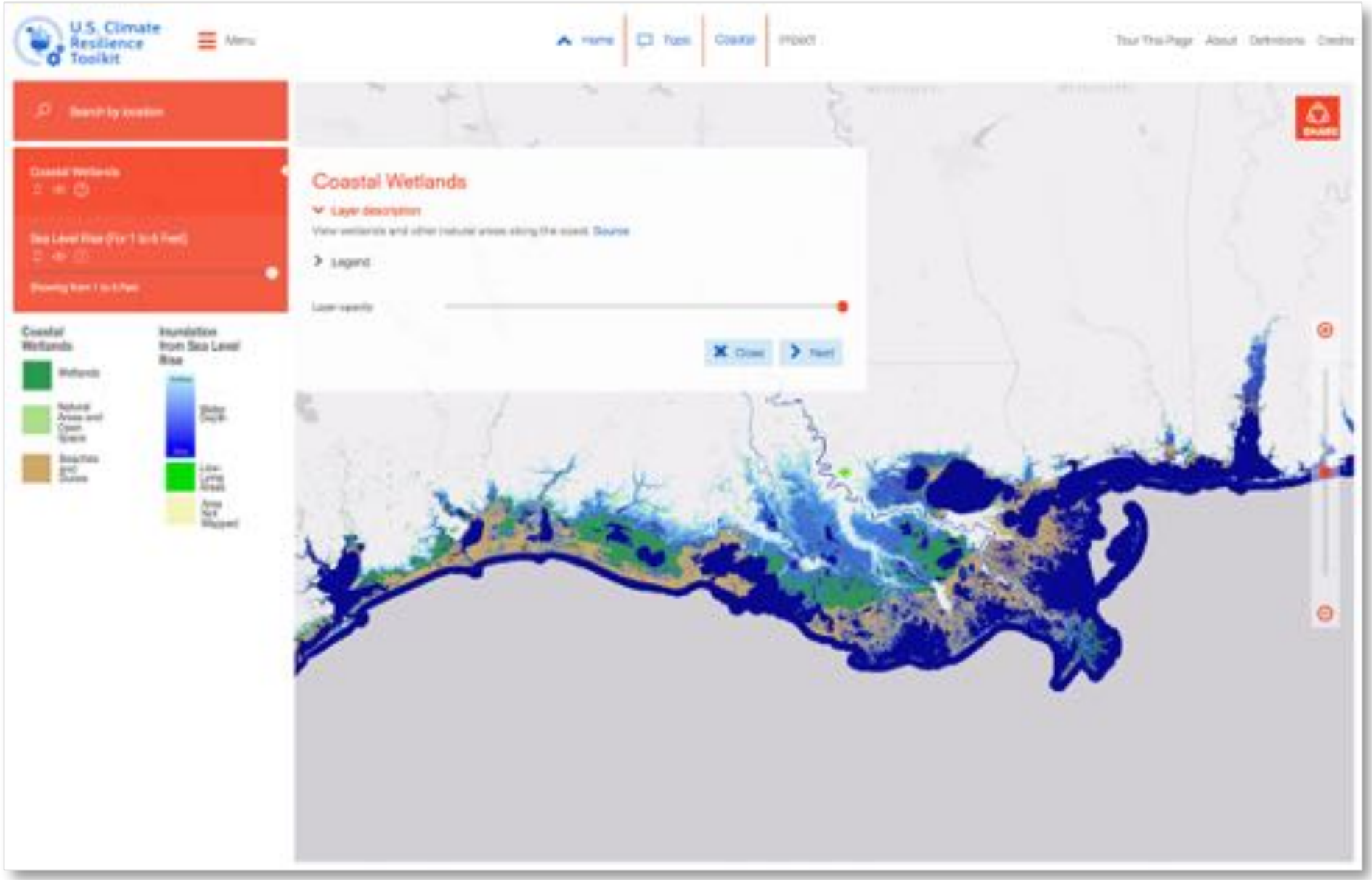
Search by Topic

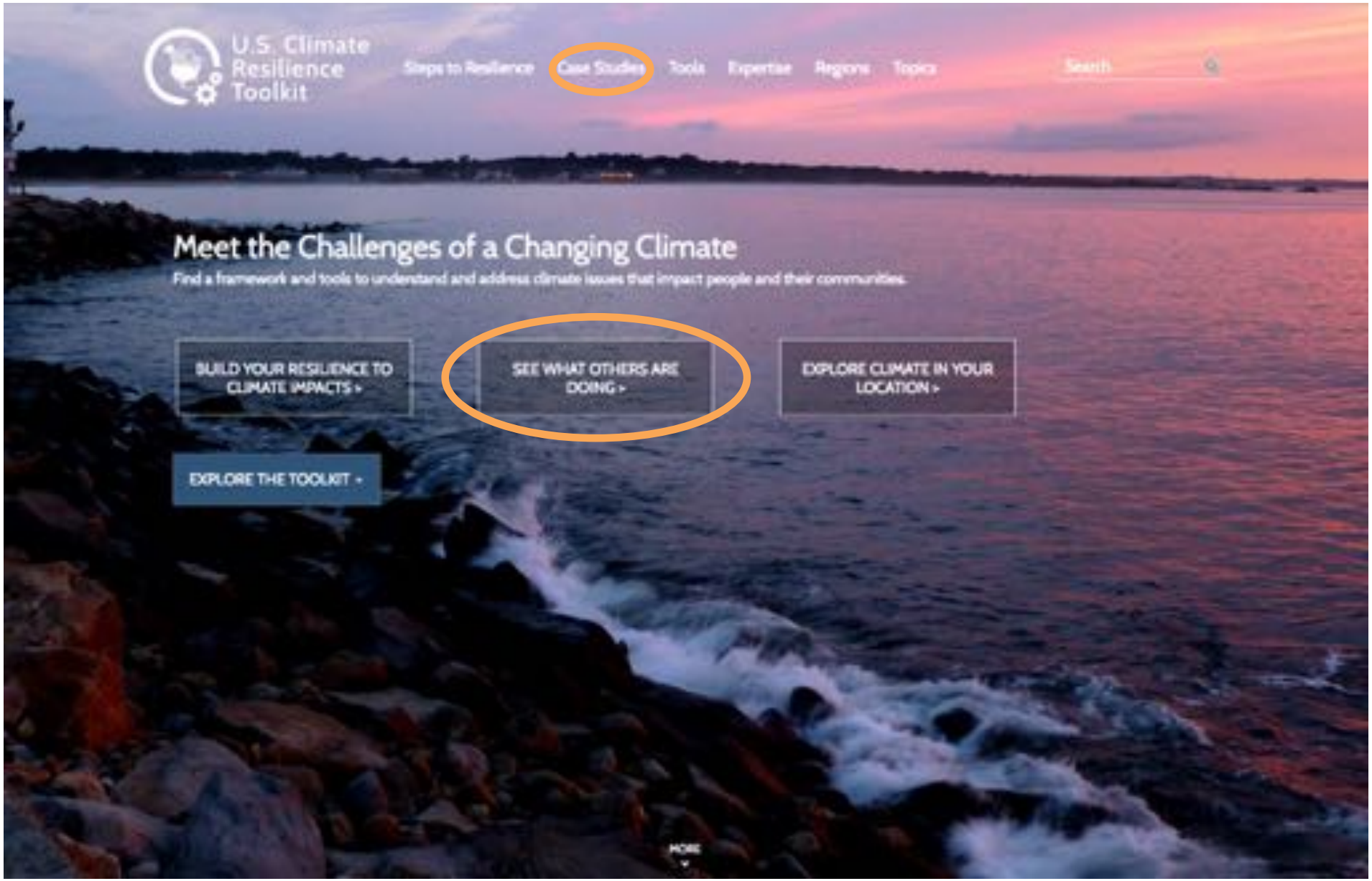


Comparison pairs of asset-threat map pairs



Comparison pairs of asset-threat map pairs




U.S. Climate Resilience Toolkit
Steps to Resilience
Case Studies
Tools
Expertise
Regions
Topics
Search
Meet the Challenges of a Changing Climate
Find a framework and tools to understand and address climate issues that impact people and their communities.
BUILD YOUR RESILIENCE TO CLIMATE IMPACTS ▸
SEE WHAT OTHERS ARE DOING ▸
EXPLORE CLIMATE IN YOUR LOCATION ▸
EXPLORE THE TOOLKIT ▸
MORE

Case Studies

Filter by climate threat/stressor: ▼ Filter by topic: ▼ Filter by steps to resilience: ▼ Filter by region: ▼

Communities and businesses are taking action to reduce their vulnerability to climate-related impacts and to build resilience to extreme events. The stories below illustrate the application of the process and tools featured in this Toolkit. Browse the stories, or filter by topic, step to resilience, and/or region in the boxes above. To expand your results, click the Clear Filters link.

Confronting Shoreline Erosion on O'ahu

Each winter, massive waves attract surfers and visitors to the North Shore of O'ahu in Hawai'i. Some years, the waves cause severe erosion, and continuing sea level rise will accelerate this issue. Residents and the state are taking steps to preserve homes and beaches.

Read more ›

How Will Fish Fare in the Future? Assessing Vulnerability Across an Ecosystem

Fisheries in the Northeast—and the businesses that depend on them—want to know how fish will respond to climate change. A new methodology helps scientists and fisheries managers identify species' vulnerability across an ecosystem.

Read more ›

Protecting Critical Infrastructure in the Nation's Capital

Changing conditions spur a utility in Washington, D.C., to consider and address its future climate vulnerabilities.

Read more ›

Assessing Climate Risks in a National Estuary

Stakeholders of the Morro Bay National Estuary Program in California worked with resources from the EPA's Climate Ready Estuaries program to identify their climate risks. Their results helped them prioritize actions for building resilience.

Read more ›

Improving Water Quality by Dealing with the First Inch of Rain

The suburban city of Mount Rainier, Maryland, is doing its part to improve the water quality of a

A Town with a Plan: Community, Climate, and Conversations

Homer, Alaska, has been taking action to reduce climate change for almost a decade. As the ten-year

Bracing for Heat

Heat waves bring some level of discomfort to nearly everyone. When excessive heat catches vulnerable populations off guard, though, discomfort can advance to

Protecting Fish to Save Coral Reefs

Coral reefs off the west coast of Maui are readily accessible and heavily used by visitors and locals alike. Managers needed a plan to

Case Studies

Communities and businesses are tak
illustrate the application of the proc
expand your results, click the Clear F

Filter by climate threat/stressor: ▲ | Filter by topic: ▼ | Filter by steps to resilience: ' | Filter by region: ▲

- Sea level rise/storm surge/coastal flooding (39)
- Drought (27)
- Extreme precipitation (25)
- Extreme events (fires/storms/hurricanes/tornadoes) (22)
- General climate change (22)
- Increased temperatures (warming) (21)
- Flooding (inland/riverine) (16)
- El Niño/La Niña/climate variability (15)
- Changes in growing seasons (14)
- Reduced sea ice/permafrost/snow (9)
- Changing ocean conditions (8)
- Temperature extremes (heat/cold) (6)

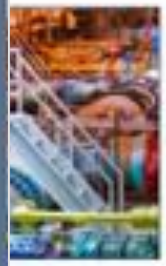
- Southwest (26)
- Northeast (20)
- Southeast (20)
- Midwest (13)
- Alaska (12)
- Northwest (8)
- Great Plains (5)
- Hawai'i (3)
- International (2)
- National (2)

to build resilience to extreme ev
ic, step to resilience, and/or regio

Confronting Shoreline Erosion on O'ahu

Each winter, massive waves attract surfers and visitors to the North Shore of O'ahu in Hawai'i. Some years, the waves cause severe eros on, and continuing sea level rise will accelerate this issue. Residents and the state are taking steps to preserve homes and beaches.

Read more ›

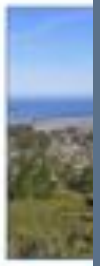


al
the Nation's

s spur a utility in
› consider and
mate

vulnerabilities.

Read more ›



Assessi
Nationa

Stakehol
National
Californi
from the
Estuaries program to identify their climate risks. Their results helped them prioritize actions for building resilience.

Read more ›

want to know how fish will respond to climate change. A new methodology helps scientists and fisheries managers identify species' vulnerability across an ecosystem.

Read more ›

Improving Water Quality by Dealing with the First Inch of Rain

The suburban city of Mount Rainier, Maryland, is doing its part to improve the water quality of a

A Town with a Plan: Community, Climate, and Conversations

Homer, Alaska, has been taking action to reduce climate change for almost a decade. As the ten-year

Bracing for Heat

Heat waves bring some level of discomfort to nearly everyone. When excessive heat catches vulnerable populations off guard, though, discomfort can advance to

Protecting Fish to Save Coral Reefs

Coral reefs off the west coast of Maui are readily accessible and heavily used by visitors and locals alike. Managers needed a plan to

Confronting Shoreline Erosion on O'ahu

Each winter, massive waves attract surfers and visitors to the North Shore of O'ahu in Hawai'i. Some years, the waves cause severe erosion, and continuing sea level rise will accelerate this issue. Residents and the state are taking steps to preserve homes and beaches.

Surf and sand on Sunset Beach

Each winter, surfers from around the world flock to Sunset Beach on O'ahu's North Shore. The huge waves that break along the beach during winter months have made it the home of the prestigious Vans World Cup of Surfing, and scores of visitors travel to the area for the competition or just to watch the massive waves. Over the years, most North Shore homeowners have become accustomed to the awesome display of waves breaking just offshore from their beachfront homes.

Over the winter of 2013–2014, however, the ocean swells threatened disaster. The pounding waves and high tides caused severe erosion and loss of land in front of about 20 homes along Sunset Beach. To the people residing along the beach, the need to protect their homes was obvious. At the same time, local regulatory agencies were challenged with balancing public safety and protecting the natural beach environment.

Intense waves and high sea level events contribute to coastal erosion, which threatened this house on the North Shore of O'ahu.

Efforts to save beaches

For many years, the typical response to the threat of coastal erosion has been to protect the land by building a seawall. Over time though, this "solution" often leads to another problem—the loss of beaches. In Hawai'i, dunes and sandy plains provide a primary source of sand to sustain beaches where erosion moves them inland. When a retreating beach runs up against a hard structure such as a seawall, it has no place to go.

Steps to Resilience:

- Step 1: Explore Climate Threats
- Step 2: Assess Vulnerability & Risks
- Step 3: Investigate Options
- Step 4: Prioritize Actions
- Step 5: Taking Action

Regions:

Hawai'i and Pacific Islands › Coastal Infrastructure ›

Topic:

Coasts › Sea Level Rise ›

Coasts › Coastal Erosion ›

Coasts › Building Resilience in Coastal Communities ›

Additional Resources:

Hawai'i Climate Adaptation Portal ›

University of Hawai'i Mānoa | Coastal Geology Group | Sea Level Rise and Coastal Erosion Maps ›

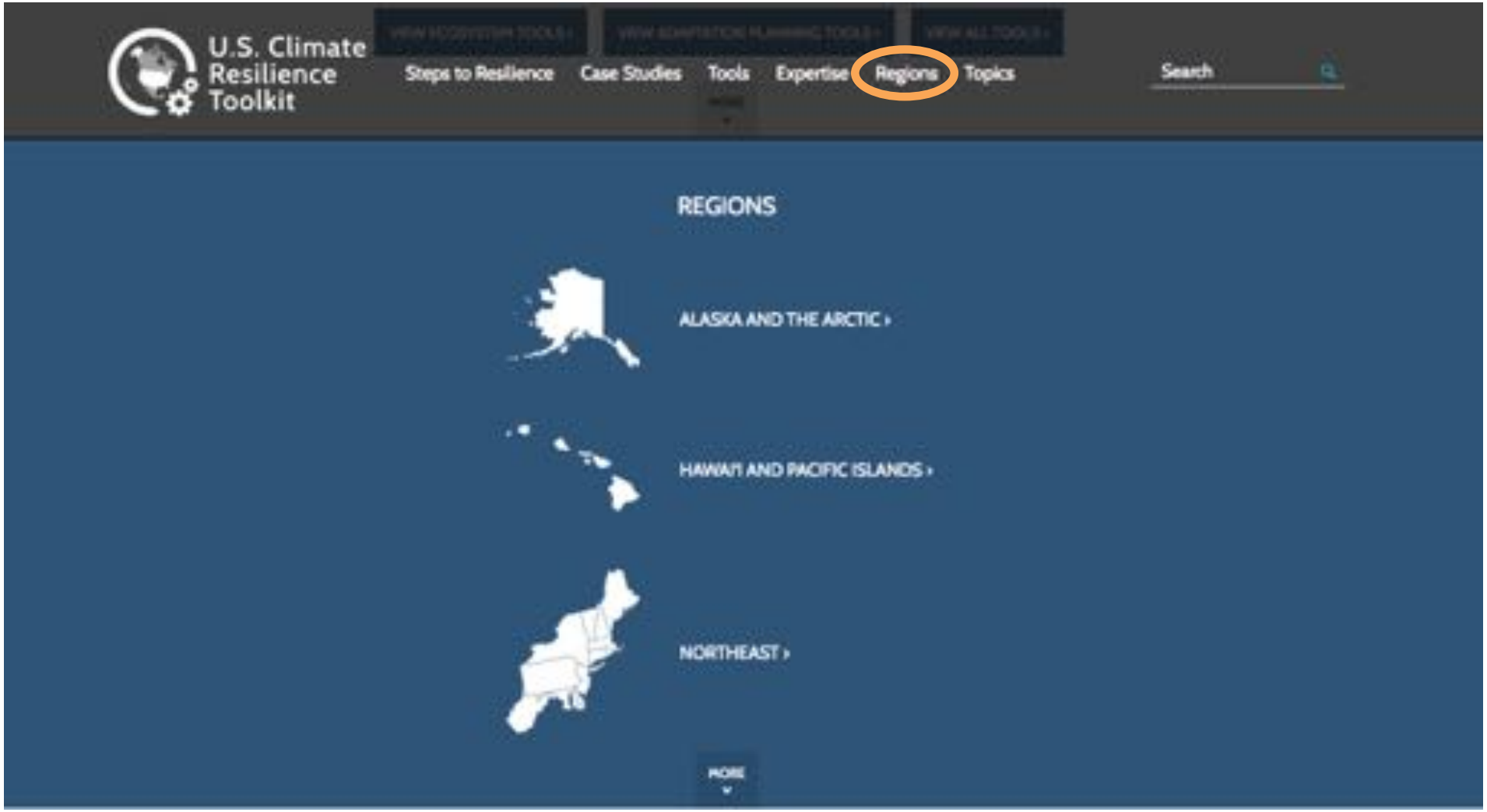
Community Resilience: Is Hawai'i ready for the impacts from climate change? ›

Partners:

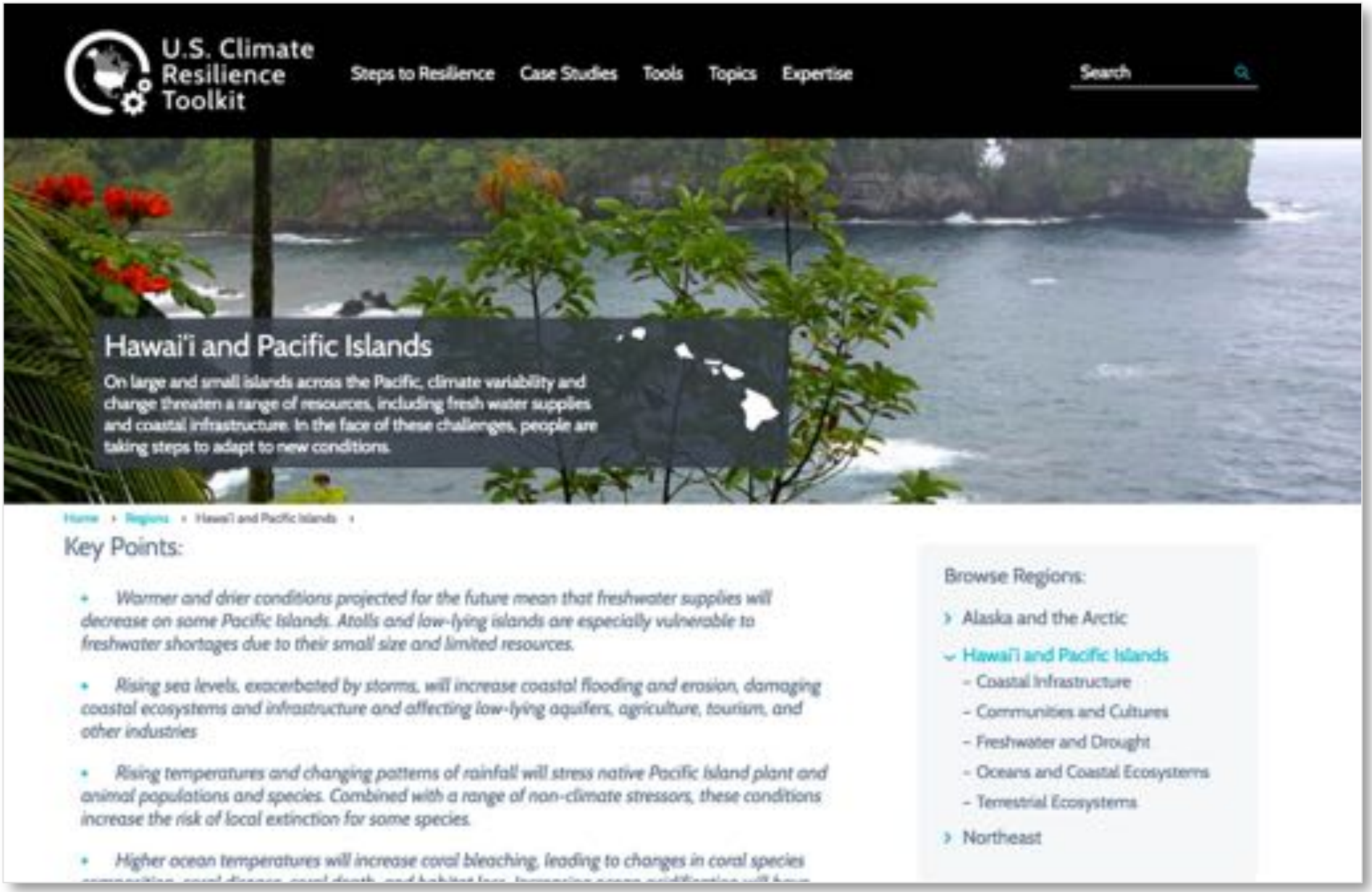
University of Hawai'i Sea Grant | Center for Coastal and Climate Science and Resilience ›

State of Hawai'i Climate Adaptation Initiative ›

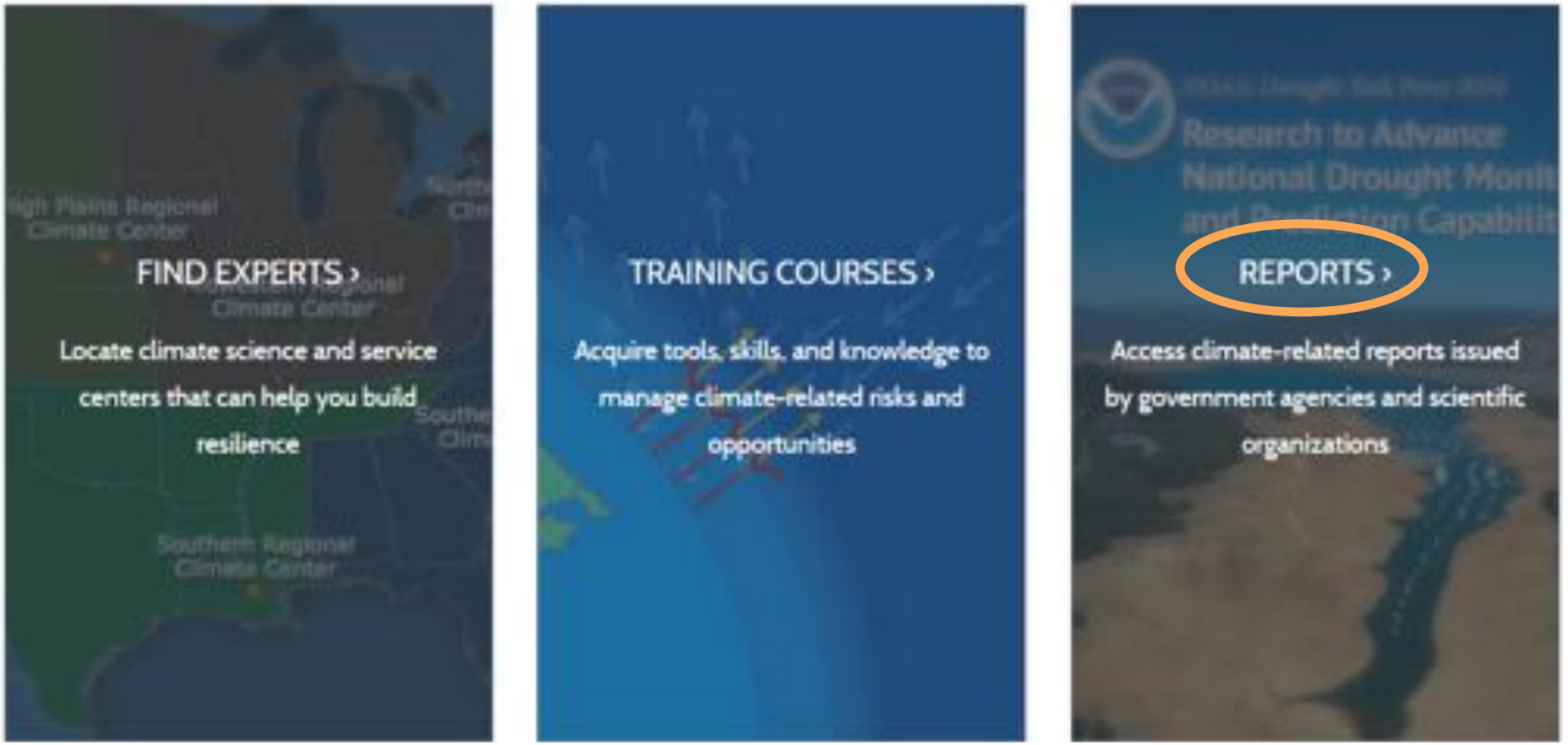
State of Hawai'i | Department of Land and Natural Resources | Office of Conservation and Coastal Lands ›

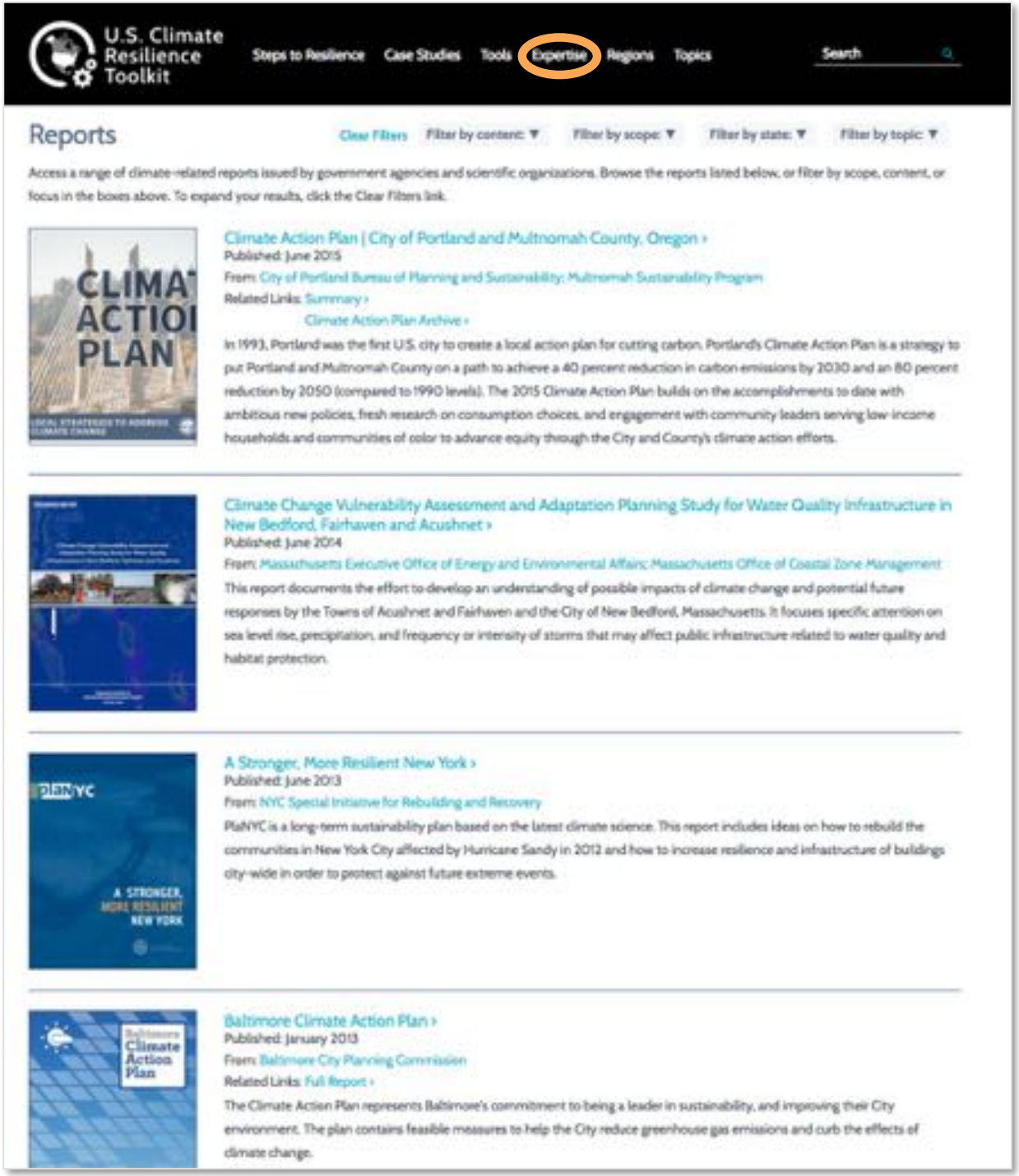

U.S. Climate Resilience Toolkit
Steps to Resilience
Case Studies
Tools
Expertise
Regions
Topics
Search
REGIONS
ALASKA AND THE ARCTIC ›
HAWAI'I AND PACIFIC ISLANDS ›
NORTHEAST ›
MORE

New content sections: Regions

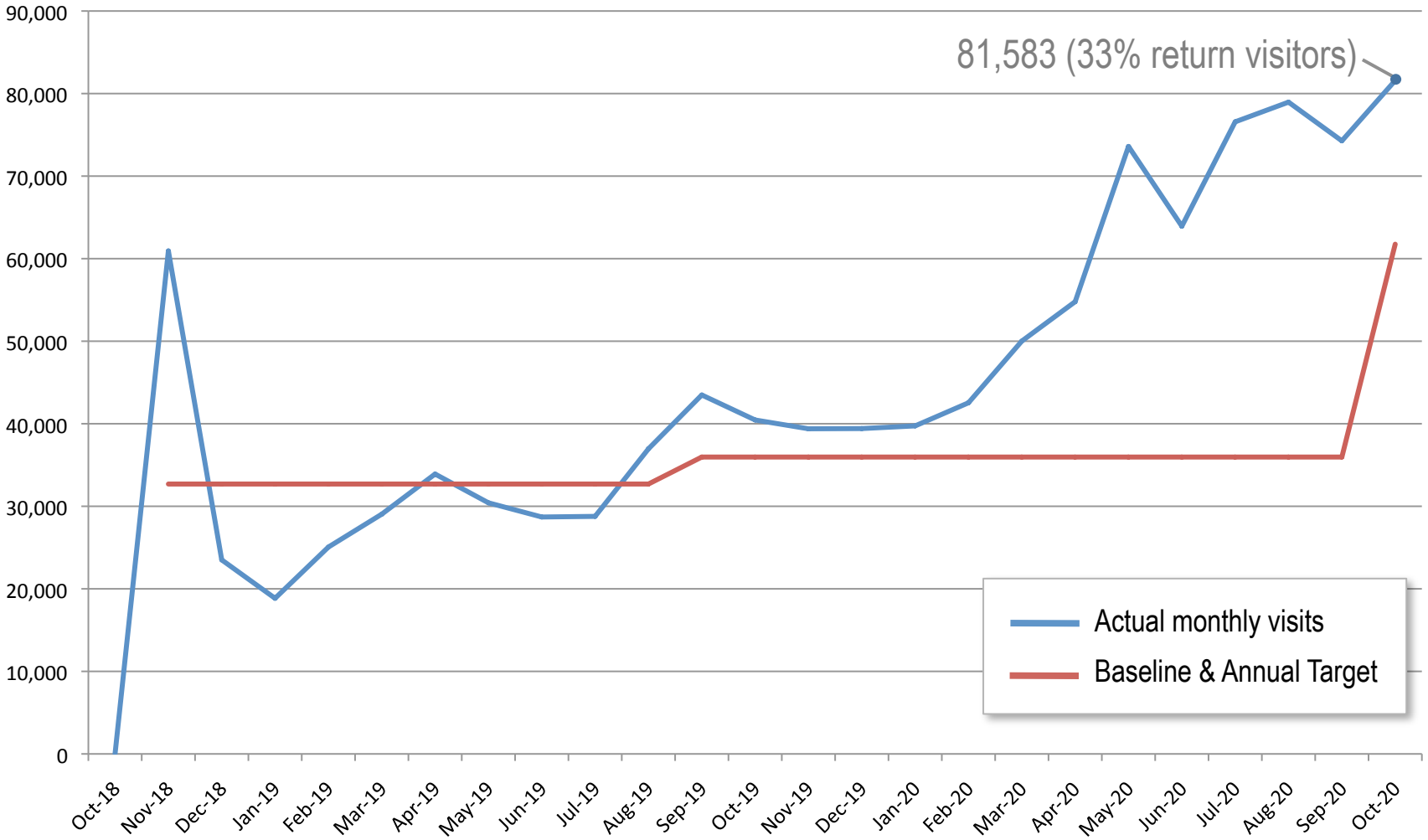


New content sections: Reports




U.S. Climate Resilience Toolkit
Steps to Resilience
Case Studies
Tools
Expertise
Regions
Topics
Search
Reports
Clear Filters
Filter by content:
Filter by scope:
Filter by state:
Filter by topic:
Access a range of climate-related reports issued by government agencies and scientific organizations. Browse the reports listed below, or filter by scope, content, or focus in the boxes above. To expand your results, click the Clear Filters link.
Climate Action Plan | City of Portland and Multnomah County, Oregon ›
Published: June 2015
From: City of Portland Bureau of Planning and Sustainability; Multnomah Sustainability Program
Related Links: Summary ›
Climate Action Plan Archive ›
In 1993, Portland was the first U.S. city to create a local action plan for cutting carbon. Portland's Climate Action Plan is a strategy to put Portland and Multnomah County on a path to achieve a 40 percent reduction in carbon emissions by 2030 and an 80 percent reduction by 2050 (compared to 1990 levels). The 2015 Climate Action Plan builds on the accomplishments to date with ambitious new policies, fresh research on consumption choices, and engagement with community leaders serving low-income households and communities of color to advance equity through the City and County's climate action efforts.
Climate Change Vulnerability Assessment and Adaptation Planning Study for Water Quality Infrastructure in New Bedford, Fairhaven and Acushnet ›
Published: June 2014
From: Massachusetts Executive Office of Energy and Environmental Affairs; Massachusetts Office of Coastal Zone Management
This report documents the effort to develop an understanding of possible impacts of climate change and potential future responses by the Towns of Acushnet and Fairhaven and the City of New Bedford, Massachusetts. It focuses specific attention on sea level rise, precipitation, and frequency or intensity of storms that may affect public infrastructure related to water quality and habitat protection.
A Stronger, More Resilient New York ›
Published: June 2013
From: NYC Special Initiative for Rebuilding and Recovery
PlaNYC is a long-term sustainability plan based on the latest climate science. This report includes ideas on how to rebuild the communities in New York City affected by Hurricane Sandy in 2012 and how to increase resilience and infrastructure of buildings city-wide in order to protect against future extreme events.
Baltimore Climate Action Plan ›
Published: January 2013
From: Baltimore City Planning Commission
Related Links: Full Report ›
The Climate Action Plan represents Baltimore's commitment to being a leader in sustainability, and improving their City environment. The plan contains feasible measures to help the City reduce greenhouse gas emissions and curb the effects of climate change.

Success metrics: visit rate thru Oct 2016



FY15 Monthly Ave. = 32,696 | FY16 Monthly Ave. = 56,139 | % Increase in FY16 = 72%

Success metrics: user analysis & evaluation

Quality of Relationship (via large survey & focus groups)

1. Awareness
2. Trust
3. Satisfaction
4. Usability / Use
5. Control Mutuality

CFI Group Analytics Package (cfigroup.com) purchased

- ✓ More detailed & higher-resolution user statistics
- ✓ Quarterly reports produced by dedicated analyst
- ✓ Questions aligned with QoR and ACSI

Parse.Ly

- ✓ A details visitor statistics analysis package & dashboard

Success metrics: People USE it!

From: Martina xxxxxx, Architect
Date: December 15, 2016

Please do not let this website go away. As an architect, **I use it frequently in my work**…it is such a great resource…

…It is good work. It means a lot to me and many other architects all over the country. I just wanted to take a moment to let you know that you have support out there from people who care and I encourage you to keep it up!

Next steps

- Synergize the Toolkit with other USGCRP projects
  - National Climate Assessment (NCA4)
  - Climate Data Initiative (CDI)
  - PREP & Resilience Dialogs
- Enhance and expand Climate Explorer 2
  - Replace BCCA with LOCA and add more projection parameters
  - Add more asset & threat map layers to Climate Explorer for every Topic & Region
  - More time-series datasets (i.e., streamflow and tide gauges)
  - User-defining thresholds with summary statistics on exceedance and rate of change
  - Work with Theme Teams to develop 'Guided Explorations'

Next steps (continued)

- Enhance ‘Steps to Resilience’ with visual interface and recommended tools & data for each step
- Develop topical & regional ‘Learning Progressions’
- Complete build out of ‘Regions’ section